Note: This is a reference cited in *AP 42, Compilation of Air Pollutant Emission Factors, Volume I Stationary Point and Area Sources.* AP42 is located on the EPA web site at www.epa.gov/ttn/chief/ap42/

The file name refers to the reference number, the AP42 chapter and section. The file name "ref02_c01s02.pdf" would mean the reference is from AP42 chapter 1 section 2. The reference may be from a previous version of the section and no longer cited. The primary source should always be checked.

AP42 Section: 11.1

Reference Number: 387

Title: Results Of The July 14, 1999 Air Emission Compliance Test On The Mathy/American Asphalt Plant No. 41 In Hatley, Wisconsin,

Interpoll Laboratories, Circle Pines, MN,

August 13, 1999.

Sec. 11.1
Ref. 387

Interpoll Laboratories, Inc.
4500 Ball Road N.E.
Circle Pines, Minnesota 55014-1819

TEL: (612) 786-6020
FAX: (612) 786-7854

RESULTS OF THE JULY 14,1999 AIR EMISSION COMPLIANCE TEST ON THE MATHY/AMERICAN ASPHALT PLANT NO. 41 IN HATLEY, WISCONSIN

Submitted to:

Mathy Construction Company
920 10th Ave. N.
Onalaska, Wisconsin 54650

Attention:

Tara Wetzel

Approved by:

Kathleen Eickstadt

Kathleen Eickstadt
Department Coordinator
Field Services Department

Report Number 9-13123
August 13, 1999
EJ/ehj

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ABBREVIATIONS

ACFM	actual cubic feet per minute
cc (ml)	cubic centimeter (milliliter)
DSCFM	dry standard cubic foot of dry gas per minute
DSML	dry standard milliliter
DEG-F (°F)	degrees Fahrenheit
DIA.	diameter
FP	finished product for plant
FT/SEC	feet per second
g	gram
GPM	gallons per minute
GR/ACF	grains per actual cubic foot
GR/DSCF	grains per dry standard cubic foot
g/dscm	grams per dry standard cubic meter
HP	horsepower
HRS	hours
IN.	inches
IN.HG.	inches of mercury
IN.WC.	inches of water
LB	pound
LB/DSCF	pounds per dry standard cubic foot
LB/HR	pounds per hour
LB/10^6BTU	pounds per million British Thermal Units heat input
LB/MMBTU	pounds per million British Thermal Units heat input
LTPD	long tons per day
MW	megawatt
mg/Nm^3	milligrams per dry standard cubic meter
ug/Nm^3	micrograms per dry standard cubic meter
microns (um)	micrometer
MIN.	minutes
ng	nanograms
ohm-cm	ohm-centimeter
PM	particulate matter
PPH	pounds per hour
PPM	parts per million
ppmC	parts per million carbon
ppm,d	parts per million, dry
ppm,w	parts per million, wet
ppt	parts per trillion
PSI	pounds per square inch
SQ.FT.	square feet
TPD	tons per day
ug	micrograms
v/v	percent by volume
w/w	percent by weight
<	≤ (when following a number)

Standard conditions are defined as 68°F (20°C) and 29.92 IN. of mercury pressure.

g:\stack\wp\misc\abbrev.frm

INTRODUCTION

On July 14, 1999 Interpoll Laboratories personnel conducted an air emission compliance test on the Mathy-American Asphalt Plant No. 41 located in Hatley, Wisconsin. The plant was tested while fired with waste oil. On-site testing was performed by Scott Fjelsta, Mike Smith, and Noah Michaelsen. Coordination between testing activities and plant operation was provided by Terry Manter of American Asphalt. The tests were witnessed by Andy Seeber and Eric Gessert of the Wisconsin Department of Natural Resources.

Testing on the No.41 Asphalt Plant Stack was conducted from six test ports evenly spaced across the face of the stack. The ports are located 2.94 diameter equivalents downstream of the nearest flow disturbance and .71 diameter equivalents upstream of the stack exit. A 30-point traverse was used to collect representative particulate samples. Each traverse point was sampled 2 minutes to give a total sampling time of 60 minutes per run.

Particulate determinations were performed in accordance with EPA Methods 1 - 5, CFR Title 40, Part 60, Appendix A (revised July 1, 1998). A preliminary determination of the gas linear velocity profile was made before the first particulate determination to select the appropriate nozzle diameter for isokinetic sample withdrawal. An Interpoll Labs sampling train which meet or exceed specifications in the above-cited reference was used to extract particulate samples by means of heated glass-lined probes. A one hour opacity determination was run simultaneously with Run 3 in accordance with EPA Method 9.

The O_2, CO_2, SO_2 determinations were performed in accordance with CFR Title 40, Part 60 Appendix B (revised July 1, 1998). Evaluations were performed in accordance with EPA Methods 3A and 6C . For oxygen analysis, a slip stream of sample gas was withdrawn from the exhaust gas stream using test ports (provided by the plant) on the stack using a heat-traced probe and filter assembly. After passing through the filter, the gas passed through two condenser-type moisture removal systems operating in series. The particulate-free dry gas was then transported to the oxygen analyzer with the excess exhausted to the atmosphere through a calibrated orifice which was used to ensure that the flow from the stack exceeds the requirements of the analyzer. For SO_2 and CO_2 analysis, a dilution probe based system was used. In this system, a slip stream of exhaust gas is drawn from the exhaust gas stream using an EPM dilution probe. The sample stream is filtered and diluted (dilution during this

test was 100:1) before delivery to the SO_2 and CO_2 analyzers. The analog response of the analyzers in both systems was recorded using a computer data logger and backed up with a strip chart recorder.

The O_2, SO_2, and CO_2 analyzers were calibrated with National Specialty Gases and Air Products and Chemicals standard gases. The instruments were calibrated before and after each run as per EPA Method 3A and 6C. The sample probe was moved through a three-point traverse (1/6, 3/6, 5/6 of the stack diameter) to measure total hydrocarbon and carbon monoxide concentrations.

The important results of the test are summarized in Section 2. Detailed results are presented in Section 3. Field data and all other supporting information are presented in the appendices.

2 SUMMARY AND DISCUSSION

The important results of the air emission compliance tests are summarized in Tables 1-2. The PM results have been calculated using the dry catch (Table 1). An overview of all results is presented in the tables on the following pages:

PARAMETER	LIMIT	MEASURED
NO.41 ASPHALT PLANT STACK		
PM		
DRY CATCH ONLY . . . . . (GR/DSCF)	0.04	0.0107
. . . . . (LB/HR)	N/A	2.62
Sulfur Dioxide		
. . . . . (ppm,w)	N/A	40.93
. . . . . (LB/HR)	N/A	16.986
Opacity		
. . . . . (%)	20%	2.02

No difficulties were encountered in the field by Interpoll Labs or in the laboratory evaluation of the samples which were conducted by Interpoll Labs. On the basis of these facts and a complete review of the data and results, it is our opinion that the results reported herein are accurate and closely reflect the actual values which existed at the time the test was performed.

SO2 EMISSIONS CALCULATIONS

Mathy / Amrican Asphalt Plant # 41

Sulfur in Burner Fuel

S = 0.47% by weight

Mass of Oil = 7.39 lb/gallon

Mass Flow of Sulfur Dioxide from the Burner

Burner fuel use = 461 gllons/hour.
461 gallons / hour x 7.399 lbs/gallon x .47/100 sulfur/oil x 2 SO2/S =
32.02 lbs SO2/hour generated in the plant drum by combustion.

Mass Flow of Sulfur Dioxide from the Plant Stack

16.986 lbs/hour

Sulfur Dioxide Capture Efficiency

EF = 100 x (Burner SO2 - Stack SO2) / Burner SO2

EF = **46.95** %

comp\plt\so2test

Table 1. Summary of the Results of the July 14, 1999 NSPS Particulate Emission Compliance Test on the Mathy Construction Plant No. 41 Located Near Hatley, Wisconsin.

ITEM	Run 1	Run 2	Run 3
Date of test	07-14-99	07-14-99	07-14-99
Time runs were done (HRS)	800/ 901	930/1033	1055/1158
Volumetric flow			
actual (ACFM)	58959	60381	60016
standard (DSCFM)	28648	28015	28820
Gas temperature (DEG-F)	259	257	254
Moisture content (%V/V)	30.50	33.79	31.77
Gas composition (%V/V,dry)			
carbon dioxide	6.41	6.83	6.83
oxygen	11.75	11.51	12.32
nitrogen	81.84	81.66	80.85
Isokinetic variation (%)	100.1	103.2	97.0
Part. emission rate (LB/HR)	2.53	2.71	2.62
Particulate concentration			
actual (GR/ACF)	.005013	.005236	.005098
standard (GR/DSCF)	.0103	.0113	.0106

Note: Dry Catch Only

* Federal regulations restrict particulate emissions from portable asphalt plants to .04 GR/DSCF, CFR Title 40, Part 60, Subpart I.

Table 2. Summary of the Results of the **Sulfur Dioxide** Emission Compliance Tests on the No. 41 Asphalt Plant Stack.

Date	Time (HRS)	Concentration (ppm,w)	Emission Rate (LB/HR)
No. 41 Asphalt Plant			
7-14-99	0800-0902	42.25	17.342
7-14-99	0930-1032	42.49	17.620
7-14-99	1055-1156	38.04	15.997
Avg		40.93	16.986

3 RESULTS

The results of all field and laboratory evaluations are presented in this section. Orsat (gas composition) and moisture is presented first followed by the computer printout of the particulate, sulfur dioxide and opacity results. Preliminary measurements including test port locations are given in the appendices.

The results have been calculated on a personal computer using programs written in Extended BASIC specifically for source testing calculations. EPA-published equations have been used as the basis of the calculation techniques in these programs. The emission rates have been calculated using the product of the concentration times flow method.

3.1 Results of Orsat and Moisture Determinations

Test No. 1
Asphalt Plant No. 41 Stack

Results of Orsat & Moisture Analyses-----Methods 3 & 4(%v/v)

	Run 1	Run 2	Run 3
Date of run	07-14-99	07-14-99	07-14-99
Dry basis (orsat)			
carbon dioxide.....	6.41	6.83	6.83
oxygen.....	11.75	11.51	12.32
nitrogen.....	81.84	81.66	80.85
Wet basis (orsat)			
carbon dioxide.....	4.45	4.52	4.66
oxygen.....	8.17	7.62	8.41
nitrogen.....	56.88	54.06	55.16
water vapor.....	30.50	33.79	31.77
Dry molecular weight.....	29.50	29.55	29.59
Wet molecular weight.....	25.99	25.65	25.90
Specific gravity.....	0.898	0.886	0.895
Water mass flow.....(LB/HR)	35271	40112	37644
FO	1.427	1.375	1.256

3.2 Results of Particulate Determinations

Test No. 1
Asphalt Plant No. 41 Stack

Results of Particulate Loading Determinations-------Method 5

	Run 1	Run 2	Run 3
Date of run	07-14-99	07-14-99	07-14-99
Time run start/end.....(HRS)	800/ 901	930/1033	1055/1158
Static pressure.....(IN.WC)	-0.94	-0.94	-0.94
Cross sectional area (SQ.FT)	13.69	13.69	13.69
Pitot tube coefficient.....	.84	.84	.84
Water in sample gas			
condenser.....(ML)	0.0	0.0	0.0
impingers.....(GRAMS)	385.0	453.0	397.0
desiccant.....(GRAMS)	20.0	22.0	22.0
total.....(GRAMS)	405.0	475.0	419.0
Total particulate material..			
.....collected(grams)	0.0291	0.0321	0.0292
Gas meter coefficient.....	0.9972	0.9972	0.9972
Barometric pressure..(IN.HG)	28.56	28.56	28.56
Avg. orif.pres.drop..(IN.WC)	1.80	1.83	1.69
Avg. gas meter temp..(DEF-F)	66.1	70.0	63.9
Volume through gas meter....			
at meter conditions...(CF)	45.35	46.07	44.05
standard conditions.(DSCF)	43.51	43.88	42.43
Total sampling time....(MIN)	60.00	60.00	60.00
Nozzle diameter.....(IN)	.252	.252	.252
Avg.stack gas temp ..(DEG-F)	259	257	254
Volumetric flow rate.....			
actual.....(ACFM)	58959	60381	60016
dry standard.....(DSCFM)	28648	28015	28820
Isokinetic variation.....(%)	100.1	103.2	97.0
Particulate concentration...			
actual.....(GR/ACF)	0.00501	0.00524	0.00510
dry standard.....(GR/DSCF)	0.01032	0.01129	0.01062
Particle mass rate...(LB/HR)	2.534	2.711	2.623

3.3 Results of Opacity Determinations

Test No. 1
Plant #41 Stack

RESULTS OF OPACITY OBSERVATIONS ——————————EPA Method 9

MINUTE	SECONDS 0	15	30	45	SIX MINUTE AVERAGES
1	10	10	10	10	
2	5	10	5	10	
3	10	5	10	10	
4	5	5	10	5	
5	5	5	5	5	
6	0	5	5	5	6.88
7	10	5	5	5	6.25
8	5	5	0	5	5.63
9	5	0	5	5	4.79
10	5	5	5	5	4.58
11	5	0	5	5	4.38
12	0	5	5	5	4.38
13	5	5	0	5	3.96
14	0	5	0	5	3.75
15	0	0	5	0	3.33
16	0	0	0	5	2.71
17	0	5	0	0	2.29
18	5	5	0	5	2.29
19	0	5	0	0	1.88
20	5	0	5	0	1.88
21	5	0	0	0	1.88
22	0	0	0	0	1.67
23	0	0	0	0	1.46
24	0	0	5	0	1.04
25	0	0	0	5	1.04
26	0	0	0	5	0.83
27	0	0	5	0	0.83
28	5	0	0	0	1.04
29	0	0	0	0	1.04
30	0	0	0	0	0.83
31	0	0	0	0	0.63
32	0	0	0	0	0.42
33	0	0	0	0	0.21
34	0	0	5	0	0.21
35	5	5	5	5	1.04
36	5	0	0	5	1.46
37	5	5	5	0	2.08
38	5	5	5	5	2.92
39	0	0	0	5	3.13
40	0	5	5	5	3.54
41	0	0	0	0	2.71
42	0	0	5	5	2.71
43	0	5	0	0	2.29
44	0	0	0	0	1.46
45	0	0	0	0	1.25
46	0	0	0	0	0.63
47	0	0	0	0	0.63
48	0	0	0	0	0.21
49	0	0	0	0	0.00
50	0	5	0	0	0.21
51	0	0	0	0	0.21
52	0	0	0	0	0.21
53	0	0	0	0	0.21
54	0	0	0	0	0.21
55	0	0	0	0	0.21
56	0	0	0	0	0.00
57	0	0	0	0	0.00
58	5	0	0	0	0.21
59	0	0	0	0	0.21
60	0	0	0	0	0.21

Average Opacity **2.02**
Highest six-minute average **6.88**

Observer : Michael Smith
Cert Date : 4/7/99
Date of Observation : 7/14/99
Time of Observation : 1058-1158

VISIBLE EMISSIONS EVALUATOR

This is to certify that

Michael Smith

met the specifications of Federal Reference Method 9 and qualified as a visible emissions evaluator. Maximum deviation on white and black smoke did not exceed 7.5% opacity and no single error exceeding 15% opacity was incurred during the certification test conducted by Eastern Technical Associates of Raleigh, North Carolina. This certificate is valid for six months from date of issue.

270121	*Minneapolis, Minnesota*	*April 7, 1999*
Certificate Number	Location	Date of Issue

President	Director of Training

3.4 Results of Sulfur Dioxide Determinations

Test No. 1
No. 41 Asphalt Plant Stack

Results of Sulfur Dioxide Determinations----------Method 6C

	Run 1	Run 2	Run 3
Date of run	7-07-99	7-07-99	7-07-99
Time run start/end (HRS)	0800-0902	0930-1032	1055-1156
Total sampling time (MIN)	60	60	60
Moisture content (%V/V)	30.48	33.77	31.03
Oxygen content (%V/V dry)	11.75	11.51	12.32
Volumetric flow rate (DSCFM)	28656	27580	29127
SO_2 concentration			
ppm wet	42.25	42.49	38.04
SO_2 emission rate (LB/HR)	17.342	17.62	15.997

4 RESULTS OF FUEL ANALYSIS

INTERPOLL LABORATORIES, INC.
(612)786-6020

Mathy Construction
Sample Log No. 13123-09

Results of Waste Oil Analysis

Source: Plant No. 41
Sample Description: Test 1
Sample Type: Waste Oil

Parameter	Units	Method	As Received
Gross heating value	BTU/LB	ASTM D240	18254
Sulfur	%	ASTM D129	0.47*
Ash	%	ASTM D482	0.63
Moisture	%	ASTM D95	5.60
Density	LB/GAL at 60°F	ASTM D1298	7.379
Specific gravity	60/60°F	ASTM D1298	0.8860

Respectfully submitted,

David J. Schneider, Manager
Chemistry Department

DJS/cg

*As requested by Mathy Construction, the sample was analyzed following the cited ASTM method. This method, however, is not applicable to the analysis of used oils.

Revised
9/10/99

APPENDIX A

SAMPLING TRAIN CALIBRATION DATA

INTERPOLL LABORATORIES, INC.
(612) 786-6020

Stack Sampling Department - QA
Aneroid Barometer Calibration Sheet

Date 7/12/99
Technician Scott Eylstra
Mercury Column Barometer No. Filter Room
Aneroid Barometer No. #20901010

Actual Mercury Barometer Read	Ambient Temp.	Temperature Correction Factor	Adjusted Mercury Barometer Read	Initial Aneroid Barometer Read	Difference (P_{ba} - P_{bm})
29.33	78	.129	29.20	29.02	.18

Has this barometer shown any consistent problems with calibration? Yes/No. If yes, explain. _____

Has problem been alleviated? Yes/No. How? _____

Note: Aneroid barometers will be calibrated periodically against a mercury column barometer. The aneroid barometer to be calibrated should be placed in close proximity to the mercury barometer and left to equilibrate for 20 - 30 minutes before calibrating. Aneroid barometer will be calibrated to the adjusted mercury barometer readings.

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INTERPOLL LABORATORIES, INC.
(612) 786-6020

Temperature Measurement Device Calibration Sheet

Unit Under Test:

Vendor	OMEGA		
Model	HH81	Serial Number	74JX1119
Range	0 2100 °F	Thermocouple Type	K
Date of Calibration	2/12/95	Technician	Scott Spalite
Method of Calibration:		PDT No.	40

☐ Comparison against ASTM mercury in glass thermometer using a thermostatted and insulated aluminum block designed to provide uniform temperature. The temperature is adjusted by adjusting the voltage on the block heater cartridge.

☑ Omega Model CL-300 Type K Thermocouple Simulator which provides 22 precise temperature equivalent millivolt signals. The CL-300 is cold junction compensated. Calibration accuracy is ± 0.1% of span (2100°F) ± 1 degree (for negative temperatures add ± 2 degrees). The CL-300 simulates exactly the millivoltage of a Type K thermocouple at the indicated temperature.

Desired Temp (°F) Nominal	Temperature of Standard or Simulated Temp (°F)	Response of Unit Under Test (°F)	Deviation	
			Δt (°F)	(%)
0	0	-4	4	.87
100	100	97	3	.54
200	200	199	1	.15
300	300	297	3	.39
400	400	397	3	.35
500	500	497	3	.31
600	600	599	1	.09
700	700	697	3	.23
800	800	800	0	.00
900	900	899	1	.07
1000	1000	999	1	.07
1100	1100	1098	2	.13
1200	1200	1199	1	.06
1300	1300	1298	2	.11
1400	1400	1401	1	.05
1500	1500	1499	1	.05
1600	1600	1602	2	.10
1700	1700	1700	2	.09
1800	1800	1802	2	.09
1900	1900	1899	1	.04
2000	2000	2000	0	.00
2100	2100	2099	1	.04
		Averages:	1.7	.17

OF = off scale response by unit under test (°F)

% dev = 100 Δt/(460 + t)

☐Unit in tolerance

☐Unit was not in tolerance: recalibrated - See new calibration sheet.

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INTERPOLL LABORATORIES, INC.
(612) 786-6020

Temperature Measurement Device Calibration Sheet

Unit Under Test:

Vendor: Omega
Model: HHS-1
Range: 0 - 2100 °F
Date of Calibration: 7/12/99
Method of Calibration:

Serial Number: 75TX0652
Thermocouple Type: K
Technician: Scott Fielstra
PDT No. 66

☐ Comparison against ASTM mercury in glass thermometer using a thermostatted and insulated aluminum block designed to provide uniform temperature. The temperature is adjusted by adjusting the voltage on the block heater cartridge.

☑ Omega Model CL-300 Type K Thermocouple Simulator which provides 22 precise temperature equivalent millivolt signals. The CL-300 is cold junction compensated. Calibration accuracy is ± 0.1% of span (2100°F) ± 1 degree (for negative temperatures add ± 2 degrees). The CL-300 simulates exactly the millivoltage of a Type K thermocouple at the indicated temperature.

Desired Temp (°F) Nominal	Temperature of Standard or Simulated Temp (°F)	Response of Unit Under Test (°F)	Deviation	
			Δt (°F)	(%)
0	0	-4	4	.07
100	100	99	1	.18
200	200	199	1	.15
300	300	297	3	.39
400	400	397	3	.35
500	500	497	3	.31
600	600	599	1	.09
700	700	698	2	.17
800	800	800	0	0.00
900	900	899	1	.07
1000	1000	999	1	.07
1100	1100	1098	2	.13
1200		1199	1	.06
1300		1298	2	.11
1400		1401	1	.05
1500		1498	2	.10
1600		1602	2	.09
1700		1698	2	.09
1800		1800	0	0.00
1900		1899	1	.04
2000		2000	0	.00
2100		2097	3	.12
		Averages:	1.63	.16

OF = off scale response by unit under test (°F)
% dev = 100 Δt/(460 + t)

☐ Unit in tolerance
☐ Unit was not in tolerance: recalibrated - See new calibration sheet.

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INTERPOLL LABORATORIES, INC.
(612) 786-6020

EPA Method 5 Gas Metering System Quality Control Check Data Sheet

Job: Murphy Date: 7/14/99
Operator: Scott Gelsler Module No.: 12

Instructions:
Operate the control module at a flow rate equal to ΔH@ for 10 minutes before attaching the umbilical.

Record the following data:

Bar press 28.56 in.Hg θ = .9972 ΔH@ 1.79 in.WC.

Time (min)	Volume (CF)	Meter Temp (°F)	
		Inlet	Outlet
	(4.25)		
2.5	6.21	74	74
5.0	8.11	74	75
7.5	10.02	75	74
10	11.96	76	74
	V_m = 7.71	Avg(t_m) = 74.5 °F	

Calculate Y_{cn} as follows:

$$Y_{cn} = \frac{1.786}{\theta\ V_m}\left[\frac{(t_m + 460)}{P_b}\right]^{0.5}$$

$$Y_{cn} = \frac{1.786}{(7.71)\ (.9972)}\left[\frac{(74.5) + 460}{(28.56)}\right]^{0.5}$$

$$Y_{cn} = 1.005$$

If Y_{cn} is not within the range of 0.97 to 1.03, "the volume metering system should be investigated before beginning."

CFR Title 40, Part 60, Appendix A, Method 5, Section 4.4.1

011995-G:\STACK\WP\FORMS\S-432

Meter Calibration Sheet EPA/Method 5

Date 5/3/99
Bar. Press 28.77 IN.HG
Wet Test Meter No. AL-20

Control Module No. 12
Serial No. DTM 1334122
Technician Duane Van Hoever

ΔH (IN.WC.) Nominal	ΔH (IN.WC.) Actual	Gas Volume Wet Test Meter (ft³)	Cal Index * (%)	Diff Wet Test Meter ΔP_w (IN.WC.)	Gas Volume Dry Test Meter (ft³) V_{dr}	Gas Volume Dry Test Meter (ft³) V_{dw}	Gas Temperatures Wet Test T_w (°F)	Gas Temperatures Dry Test t_{di} (°F)	Gas Temperatures Dry Test t_{do} (°F)	Time (Min/Sec)	Meter Coeff. Y	Orifice Const. ΔH@	C_i
0.5		2	99.6	0.01	896.67	898.735	72	94	81	4:54	.9915	1.72	
1.2		3	99.8	0.025	893.08	896.16	72	96	81	4:53	.9991	1.81	
2		3	100.00	0.055	889.475	892.56	71.8	97	81	3:47	.9987	1.80	
3.3		5	100.00	0.09	883.84	888.96	71.8	98	80	4:56	.9995	1.82	
1		3	4	5	6	7	8	9	10	11 12			
										Avg	.9972	1.79	

Positive leak check performed by [signature]
Meter was in tolerance ☒
Approved by

Meter was not in tolerance ☐: readjusted linkage
Meter was not in tolerance ☐:changed dry test meter
Date

*Based on AL-20 wet test meter calibration in April 1997 against Bell Prover (NBS Traceable) - Carl Poe Co.

Interpoll Laboratories, Inc.
(612) 786-6020

Meter Box Calibration and Usage Status

Date of Report: August 16, 1999

Meter Box No. : 12 (Rockwell Dry Test Meter Serial No. 1334116)

Date of Last Calibration: May 3, 1999
Calibration Technician: Duane Van Hoever
Wet Test Meter No.: American Meter AL-20

Date of Use	Report No.	Initial Meter Reading	Final Meter Reading	Volume/Job (cu. ft.)	Total Volume* (cu. ft.)
May 5, 1999	9-12739	904.40	1117.51	213.11	213.11
May 11-12, 1999	9-12754	120.10	627.78	507.68	720.79
May 20-21, 1999	9-12793	628.40	1002.30	373.90	1094.69
July 14, 1999	9-13123	4.25	148.85	144.60	1239.29

* Total volume through meter since last calibration.

Interpoll Laboratories
(612) 786-6020

Nozzle Calibration Data Sheet

Date of Calibration: July 14, 1999
Technician: S. Fjelsta
Nozzle Number: 4-4

The nozzle is rotated in 60 degree increments and the diameter at each point is measured to the nearest 0.001 inch. The observed readings and average are shown below.

Position	Diameter (inches)
1	0.252
2	0.252
3	0.252
Average	0.252

APPENDIX B

LOCATION OF TEST PORTS

MATHY CONSTRUCTION COMPANY - ENVIRONMENTAL
SAMPLING SITE DETAIL

PLANT #411

Dimensions :

Width = 73 inches

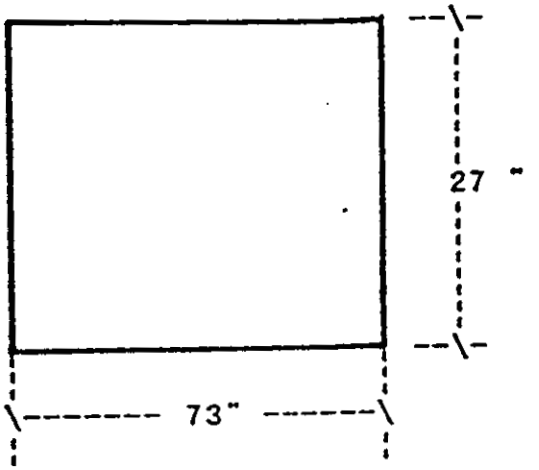
Length = 27 inches

Equiv.Diameter = $\frac{2\ L\ W}{(L + W)}$ = 39.42 inches

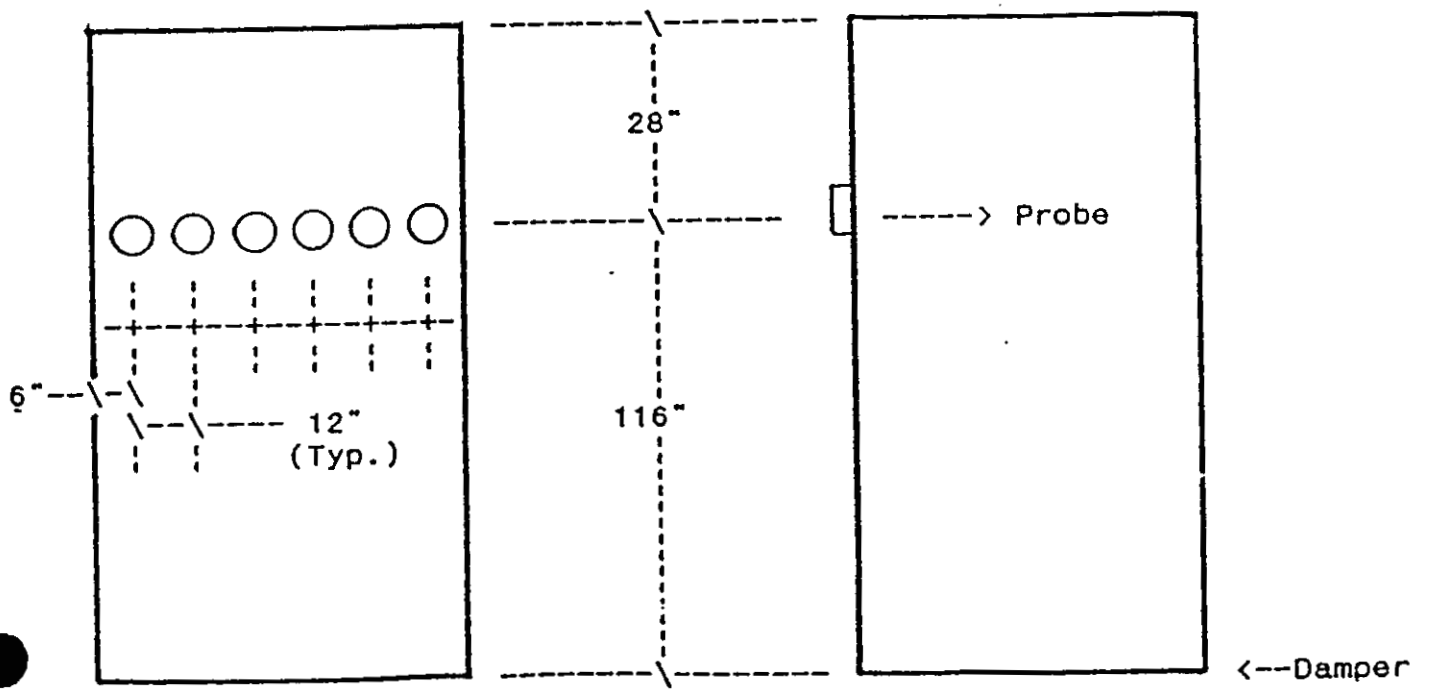
o. of Ports = 6 No. of Traverse Points = 24

utside Port Spacing = 6 inches

nside Port Spacing = 12 inches



1 . 3.38"
2 . 10.13"
3 . 16.88
4 . 23.63"



APPENDIX C

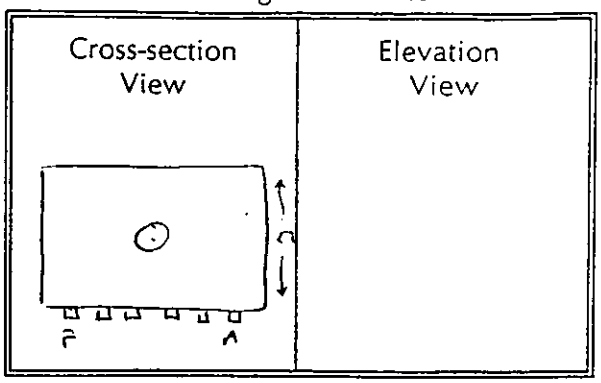
FIELD DATA SHEETS

INTERPOLL LABORATORIES, INC.
(612) 786-6020

EPA Method 2 Field Data Sheet

Job: Mathy
Source: Plant #41 Stack
Test: 1 Run 0 Date 7/14/99
Stack Dimen.: 73 X 27 IN.
Dry Bulb: °F Wet bulb: °F
Manometer: ☒ Reg. ☐ Exp ☐ Elec.
Barometric Pressure: 28.56 IN.HG
Static Pressure: -.94 IN.WC
Operators: Scott Fjelstad / Mark Mikkelsen
Pitot No.: U22-4 C_p 0.84

Drawing of Test Site



Particulate

Traverse Point No.	Fraction of Diameter	Distance From Stack Wall (IN.)	Distance From End of Port (IN.)	Velocity	Temp. of Gas
		Port Length: 3.0 IN.		Time Start: 7:30 HRS	
A - 1		2.70	5.70		
2		8.10	11.10		
3		13.50	16.50		
4		18.90	21.90		
5		24.30	27.30		
B - 1					
2					
3					
4					
5					
C - 1					
2					
3					
4					
5					
D - 1					
2					
3					
4					
5					
E - 1					
2					
3					
4					
5					

Temp. Meas. Device & S/N: PDT - #66, 60 Time End: 7:45 HRS

R or nothing = reg. manometer; S = expanded; E = electronic

032594-G:\STACK\WP\FORMS\S-392.1

INTERPOLL LABORATORIES, INC.
(612) 786-6020
Interpoll Laboratories EPA Method 5/202 Sample Log Sheet

Job Mathy
Source Plant #41 Stack
Method 5

Date 2/14/95 Test 1 Run 1
No. of traverse points 30
Filter holder Glass Filter Type 4" Glass Fiber

Sample train Leak Check:
Pretest: ≤ 0.02 cfm @ 15 In. Hg (vac) ✓
Post test [illegible] cfm @ 10 Hg (vac)

Particulate Catch Data
No. of filters used
977

Recovery Solvents
Acetone ✓
Others

No. of probe wash bottles: 1
Sample recovered by: SF

Condensate Data:

Item	Weight (g) Final	Tare	Difference
Impinger No. 1	686	495	191
Impinger No. 2	392	198	194
Impinger No. 3			
Condenser			
Desiccant	1510	1490	20
Total			405

385

EPA Method 202 Data:
pH of Impinger Catch: Purge: Time: Date:
Tare weight of imp catch jar: 8

Integrated Bag Sample:
Bag Pump No. Box No. Bag No.
Bag Material 5-layer aluminized Tedlar Size: 44L
Pretest Leak Check: cc/min @ In.Hg
Time Start: Time End

S/N of O2 Analyzer

G:\Stack\WP\Forms\S-0046

(612) 786-6020

EPA Method 5 Field Data Sheet

Job: Mathy
Source: Plant #41 Stack
Date: 7/13/99 Test 1 Run 1

Operators: SF/NM
Meter Box No.: 12 ΔH@ 1.79 in.WC
Gasmeter Coeff.: .9972

Nozzle No.: 4-4
Nozzle Dia.: .252 in.
Bar. Press.: 28.56 in.Hg

Pitot No.: V62-4
C_p: 0.84
H_2O: 3.2 %

Traverse Point No.	Sampling Time (min)	Sample Vol. (cf)	Velocity Head (in.WC)	Orifice Meter (in.WC)	Des. Vol. (cf)	VAC. (in.Hg)	Temperatures (°F) Stack	Probe	Oven	Imp.	Gas/In	Gas/Out	Oxygen (% v/v)
	(min)	12.90											
A-5	2	14.65	1.20	2.07	4.57	7	260	241	251	37	71	71	13.4
4	4	16.37	1.35	2.29	6.31	7	260	242	250	38	71	71	13.4
3	6	18.15	1.40	2.37	8.08	8	262	245	244	40	70	71	13.5
2	8	19.90	1.35	2.28	9.82	8	262	244	243	41	72	69	13.6
1	10	21.46	1.20	2.03	11.46	7	261	242	245	41	72	68	13.6
B-5	12	23.01	1.20	2.03	3.09	7	261	245	247	40	72	66	12.6
4	14	24.71	1.40	2.36	4.86	8	262	244	248	41	72	66	12.4
3	16	26.55	1.45	2.44	6.65	9	262	244	247	42	71	65	12.9
2	18	28.31	1.20	2.02	8.24	8	261	241	248	42	71	65	13.0
1	20	29.92	1.15	1.94	9.87	7	260	240	247	42	72	64	12.7
C-5	22	31.56	1.30	2.19	1.59	8	260	241	246	42	72	64	12.5
4	24	33.30	1.40	2.36	3.35	8	260	241	246	43	72	64	12.5
3	26	35.10	1.30	2.20	5.15	8	258	241	247	43	72	63	12.4
2	28	36.90	1.50	2.52	6.87	9	261	242	246	44	71	63	12.4
1	30	38.72	1.40	2.35	8.63	9	262	244	247	44	71	63	12.1
D-5	32	39.93	.76	1.28	9.93	5	262	243	248	45	71	64	12.2
4	34	41.60	1.30	2.20	1.63	8	258	244	247	44	72	64	11.9
3	36	43.40	1.50	2.53	3.45	9	260	243	248	45	71	65	11.9
2	38	45.03	1.10	1.86	5.02	7	259	245	247	45	71	64	11.9
1	40	46.62	1.10	1.86	6.58	7	259	245	247	45	72	64	11.9
E-5	42	47.69	.47	0.79	7.61	3	259	244	248	45	72	64	12.0
4	44	48.80	.57	.91	8.68	4	258	245	249	46	72	65	11.9
3	46	50.35	1.10	1.86	0.24	6	258	246	247	46	71	64	12.0
2	48	51.75	.93	1.57	1.69	5	257	242	248	46	71	63	12.0
1	50	53.07	.81	1.37	3.03	5	257	243	249	47	72	62	12.1
	θ = —	V_m = cont.		ΔH@ = —							Avg. = —		

Pg. 1 of 2

INTERPOLL LABORATORIES, INC.
(612) 786-6020

EPA Method 5 Field Data Sheet

Job: mating
Source: Plant #41 stack
Date: 7/14/95 Test 1 Run 1

Operators: SF/NM
Meter Box No. 12 ΔH@ 1.79 in.WC
Gasmeter Coeff. .9972

Nozzle No. 4-4
Nozzle Dia. .254 in.
Bar. Press. 28.58 in.Hg

Pitot No. 032-4
C_p 0.84
H_2O 30 %

Traverse Point No.	Sampling Time (min)	Sample Vol. (cf)	Velocity Head (in.WC)	Orifice Meter (in.WC)	Des. Vol. (cf)	VAC. (in.Hg)	Temperatures (°F) Stack	Probe	Oven	Imp.	Gas/In	Gas/Out	Oxygen (% v/v)
	-	-											
E - 5	52	53.96	.34	.57	3.90	3	257	244	249	48	72	63	12.2
4	54	55.00	.36	.95	5.03	4	255	245	251	48	72	63	12.0
3	56	56.11	.54	.94	6.11	4	255	246	251	49	71	63	12.0
2	58	57.24	.57	.97	7.24	4	254	247	251	50	71	62	16.4
1	60	58.25	.45	.76	8.25	3	253	246	250	51	71	61	16.8
	(9:01)												
	θ = 60	V_m = 45.35		ΔH = 1.00							Avg. = 66.1		

Pg. 2 of 2

08/19/94 GASTACK\WPFORMS\5.DB

INTERPOLL LABORATORIES, INC.
(612) 786-6020
Interpoll Laboratories EPA Method 5/202 Sample Log Sheet

Job Mosby
Source Plant #41 stack
Method 5

Date 7/26/95 Test 1 Run 2
No. of traverse points 30
Filter holder Glass Filter Type 4" Glass Fiber

Sample train Leak Check:
Pretest: ≤ 0.02 cfm @ 15 In. Hg (vac) ✓
Post test <0.02 cfm @ 11 Hg (vac) ✓

Particulate Catch Data
No. of filters used
940

Recovery Solvents
Acetone ✓
Others

No. of probe wash bottles: 1
Sample recovered by: SF

Condensate Data:

Item	Weight (g) Final	Tare	Difference
Impinger No. 1	668	488	180
Impinger No. 2	465	192	273
Impinger No. 3			
Condenser			
Desiccant	1514	1492	22
Total			475

453

EPA Method 202 Data:
pH of Impinger Catch:
Tare weight of imp catch jar: g

Purge: Time: Date:

Integrated Bag Sample:
Bag Pump No.
Bag Material 5-layer aluminized Tedlar
Pretest Leak Check:
Time Start:

Box No. Bag No.
Size: 44L
cc/min @ In.Hg
Time End

S/N of O2 Analyzer

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INTERPOLL LABORATORIES, INC.
(612) 786-6020

EPA Method 5 Field Data Sheet

Job: McHy
Source: Plant #41 Stack
Date: 7/14/95 Test 1 Run 2

Operators: SC/NM
Meter Box No. 12 ΔH@ 1.79 in.WC
Gasmeter Coeff. .9972

Nozzle No. 4-4
Nozzle Dia. .252 in.
Bar. Press. 28.56 in.Hg

Pitot No. 212-4
C_p 0.84
H_2O 31 %

Traverse Point No.	Sampling Time (min)	Sample Vol. (cf)	Velocity Head (in.WC)	Orifice Meter (in.WC)	Des. Vol. (cf)	VAC. (in.Hg)	Temperatures (°F) Stack	Probe	Oven	Imp.	Gas/In	Gas/Out	Oxygen (% v/v)
	(9:30)	58.45											
A - 5	2	60.02	1.20	1.97	0.06	6	258	235	250	40	74	74	11.7
4	4	61.64	1.20	2.00	1.69	6	259	235	250	40	74	73	11.6
3	6	63.41	1.45	2.41	3.48	8	260	232	251	41	74	72	11.6
2	8	65.27	1.50	2.49	5.30	9	259	230	252	42	74	72	11.7
1	10	67.12	1.45	2.42	7.09	9	258	231	251	42	74	70	11.7
B - 5	12	68.44	1.30	2.16	8.79	7	258	236	250	42	73	68	11.8
4	14	70.41	1.40	2.32	0.54	8	257	236	249	42	73	68	11.7
3	16	72.17	1.50	2.48	2.36	8	259	236	249	41	73	67	11.7
2	18	74.01	1.52	2.48	4.17	9	259	237	249	42	73	66	11.6
1	20	75.85	1.40	2.31	5.91	9	259	236	247	42	74	69	11.6
C - 5	22	77.35	.92	1.53	7.34	6	259	239	247	42	74	69	11.6
4	24	78.95	.90	1.50	8.75	5	256	240	246	42	74	69	11.7
3	26	80.60	1.60	2.66	0.63	8	258	237	255	42	72	67	11.6
2	28	82.36	1.45	2.39	2.41	9	260	229	254	42	72	67	11.6
1	30	84.21	1.40	2.31	4.15	9	259	230	255	43	72	66	11.6
D - 5	32	85.40	.73	1.21	5.49	5	259	231	254	45	73	66	11.6
4	34	87.01	1.40	2.32	7.17	8	256	230	255	46	72	66	11.5
3	36	88.79	1.50	2.49	8.98	9	256	231	251	47	73	66	11.5
2	38	90.61	1.30	2.15	0.67	8	259	230	250	46	72	65	11.6
1	40	92.08	.98	1.62	2.13	6	267	231	250	46	72	65	11.6
E - 5	42	93.41	.80	1.32	3.46	5	257	232	251	47	72	64	11.7
4	44	94.80	.92	1.52	4.88	5	256	231	257	48	72	64	11.6
3	46	96.25	1.05	1.73	6.39	6	258	233	256	49	72	65	11.7
2	48	97.84	1.10	1.82	7.94	6	258	237	256	50	73	64	11.7
1	50	99.20	.75	1.25	9.23	6	257	239	255	50	72	64	11.7
	0 - —	V_m - cont -		ΔH - —							Avg. - —		

Pg. 1 of 2

INTER... SITE ...ORA... ...RIES, ...C.
(612) 706-6020

EPA Method 5 Field Data Sheet

Job: McKay
Source: Plant #41 Stack
Date: 7/14/95 Test 1 Run 2

Operators: SF/NM
Meter Box No. 12 ΔH@ 1.79 in.WC
Gasmeter Coeff. .9972

Nozzle No. 4-4
Nozzle Dia. .252 in.
Bar. Press. 28.56 in.Hg

Pitot No. 022-4
C_p 0.84
H_2O 31 %

Traverse Point No.	Sampling Time (min)	Sample Vol. (cf)	Velocity Head (in.WC)	Orifice Meter (in.WC)	Des. Vol. (cf)	VAC. (in.Hg)	Temperatures (°F) Stack	Probe	Oven	Imp.	Gas/In	Gas/Out	Oxygen (% v/v)
	—	- cont -											
A - 5	52	100.00	.29	.48	0.02	3	257	241	255	57	72	65	11.7
4	54	101.21	.61	1.01	1.18	4	255	240	255	51	73	66	12.1
3	56	102.42	.64	1.06	2.37	4	255	241	255	52	73	64	12.1
2	58	103.52	.52	.86	3.44	4	254	247	259	52	73	64	12.2
1	60	104.52	.40	.67	4.39	3	252	249	260	53	73	64	12.1
	(10:33)												
	θ - 60	V_m - 46.07		ΔH - 1.83							Avg. - 70		

Pg. 2 of 2

C-7

INTERPOLL LABORATORIES, INC.
(612) 786-6020
Interpoll Laboratories EPA Method 5/202 Sample Log Sheet

Job Mathy
Source Plant #41 Stack
Method 5

Date 7/14/99 Test 1 Run 3
No. of traverse points 30
Filter holder Glass Filter Type 4" Glass Fiber

Sample train Leak Check:
Pretest: ≤ 0.02 cfm @ 15 In. Hg (vac) ✓
Post test ≤0.00 cfm @ 10 Hg (vac) ✓

Particulate Catch Data
No. of filters used 984

Recovery Solvents
Acetone ✓
Others

No. of probe wash bottles: 1
Sample recovered by: SF

Condensate Data:

Item	Weight (g) Final	Tare	Difference
Impinger No. 1	752	472	280
Impinger No. 2	318	201	117
Impinger No. 3			
Condenser			
Desiccant	1465	1443	22
Total			419

397

EPA Method 202 Data:
pH of Impinger Catch: Purge: Time: Date:
Tare weight of imp catch jar: g

Integrated Bag Sample:
Bag Pump No.
Box No. Bag No.
Bag Material 5-layer aluminized Tedlar
Size: 44L
Pretest Leak Check: cc/min @ In.Hg
Time Start: Time End

S/N of O2 Analyzer

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INT... ...OR. ... ...
(612) 786-6020

EPA Method 5 Field Data Sheet

Job: Mathy
Source: Plant #41 Stack
Date: 7/14/99 Test: 1 Run: 3

Operators: SE/NM
Meter Box No.: 12 ΔH@ 1.75 in.WC
Gasmeter Coeff.: .9972

Nozzle No.: 4-4
Nozzle Dia.: .1252 in.
Bar. Press.: 28.56 in.Hg

Pitot No.: 022-4
C_p: 0.84
H_2O: 34 %

Traverse Point No.	Sampling Time (min)	Sample Vol. (cf)	Velocity Head (in.WC)	Orifice Meter (in.WC)	Des. Vol. (cf)	VAC. (in.Hg)	Temperatures (°F) Stack	Probe	Oven	Imp.	Gas/In	Gas/Out	Oxygen (% v/v)
	(10.55)	104.80											
A - 5	2	106.10	.78	1.21	6.06	4	253	250	245	42	70	64	12.2
4	4	107.55	1.10	1.70	7.56	4	254	250	245	42	70	65	12.2
3	6	109.17	1.30	2.00	9.18	8	258	250	249	41	70	63	12.1
2	8	110.70	1.30	1.99	0.80	8	256	247	248	42	70	63	12.2
1	10	112.31	1.20	1.84	2.36	7	256	246	247	42	70	63	12.2
B - 5	12	113.80	1.10	1.69	3.85	6	256	247	248	42	71	64	12.4
4	14	115.38	1.20	1.84	5.41	7	255	245	247	43	71	63	12.3
3	16	117.00	1.40	2.15	7.09	8	256	246	245	44	71	63	12.3
2	18	118.71	1.35	2.06	8.73	8	258	245	249	44	71	62	12.3
1	20	120.26	1.20	1.83	0.29	7	258	244	248	43	70	62	12.4
C - 5	22	121.79	1.10	1.68	1.77	6	258	243	248	44	70	61	12.3
4	24	123.62	1.70	2.58	3.61	9	261	240	247	45	70	61	12.5
3	26	125.43	1.60	2.43	5.34	9	261	243	246	46	70	61	12.4
2	28	127.20	1.50	2.28	7.12	9	261	242	246	47	70	61	12.4
1	30	128.79	1.35	2.06	8.76	7	259	240	249	48	71	61	12.3
D - 5	32	130.56	1.60	2.43	0.55	9	259	241	249	48	70	61	12.6
4	34	132.15	1.20	1.84	2.10	7	254	240	249	49	69	61	12.7
3	36	133.91	[illegible]	2.45	3.90	9	254	239	251	49	70	62	12.7
2	38	135.60	1.40	2.15	5.57	8	254	241	254	50	70	61	12.6
1	40	137.30	1.30	2.00	7.20	7	251	242	254	51	70	62	12.7
E - 5	42	139.40	.62	.96	8.32	4	251	243	255	50	70	62	12.8
4	44	139.70	.95	1.47	9.71	5	250	242	254	51	70	62	12.8
3	46	141.24	1.20	1.85	1.27	7	250	243	254	52	70	62	12.6
2	48	142.71	.90	1.39	2.62	6	250	243	254	52	70	61	12.6
1	50	143.46	.71	1.09	3.92	6	252	244	254	52	69	61	12.7
	0 -	V_m - Cont		ΔH -							Avg. -		

Pg. 1 of 2

INTERPOLL LABORATORIES, INC.
(612) 786-6020

EPA Method 5 Field Data Sheet

Job: Nathy
Source: Plant #41 s/2.R
Date: 7/14/89 Test 1 Run 3

Operators: SE/NM
Meter Box No. 12 ΔH@ 1.77 in.WC
Gasmeter Coeff. .9922

Nozzle No. 4-4
Nozzle Dia. .252 in.
Bar. Press. 28.56 in.Hg

Pitot No. VCL-4
C_p 0.84
H_2O 38 %

Traverse Point No.	Sampling Time (min)	Sample Vol. (cf)	Velocity Head (in.WC)	Orifice Meter (in.WC)	Des. Vol. (cf)	VAC. (in.Hg)	Temperatures (°F) Stack	Probe	Oven	Imp.	Gas/In	Gas/Out	Oxygen (% v/v)
	–	Cont.											
E-5	52	144.92	.38	.50	4.70	3	251	247	249	52	70	61	12.5
4	54	145.80	.48	.74	5.69	3	249	247	251	52	70	62	12.7
3	56	146.81	.64	.99	6.93	4	250	248	251	53	70	62	12.6
2	58	147.90	.54	.84	7.88	4	248	247	250	53	70	61	12.7
1	60	148.85	.48	.74	8.87	3	248	249	249	54	70	62	12.6
	(4:58)												
	θ = 60	V_m = 44.05		1.69 ΔH =							Avg. = 63.5		

Pg. 2 of 2

EPA

VISIBLE EMISSION OBSERVATION FORM 1

Form Number	Page	Of
1.1	1	2

Continued on VEO Form Number: 1.1

Method (Circle One): Method 9 | 203A | 203B | Other: _____

Company Name: American Asphalt

Facility Name: Plant #41 Hatley WI

Street Address: ~~[illegible]~~ county Y

City: Hatley | State: WI | Zip:

Process: Asphalt | Unit #: | Operating Mode: 100%

Control Equipment: baghouse | Operating Mode:

Visible Emission Point: rectangular stack

Height of Emis. Pt.: Start 30' End ✓ | Height of Emis. Pt. Rel. to Observer: Start 30' End ✓

Distance to Emis. Pt.: Start 93' End ✓ | Direction to Emis. Pt. (Degrees): Start W End ✓

Vertical Angle to Obs. Pt.: Start End | Direction to Obs. Pt. (Degrees): Start W End ✓

Distance and Direction to Observation Point from Emission Point: Start 7' above stack End ✓

Visible Emissions: Start (dark) coming End ✓

Emission Color: Start dark End ✓ | Water Droplet Plume: Attached ☒ Detached ☒ None ☐

Visible Plume Background: Start sky End ✓

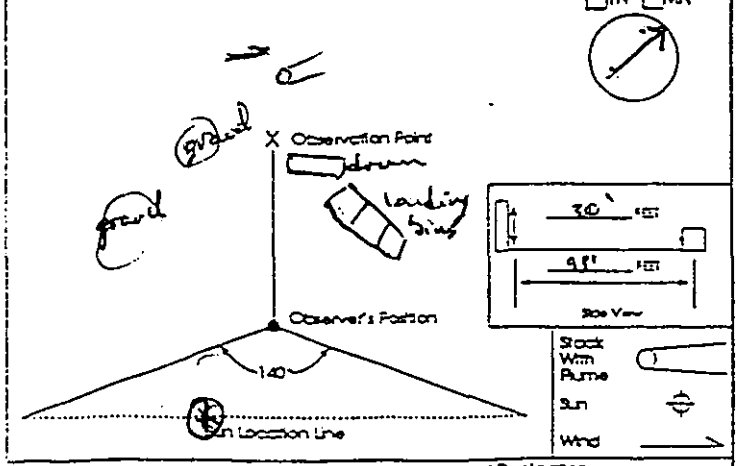
Background Color: Start dark End blue/white | Sky Conditions: Start cloudy End partly sunny

Wind Speed: Start 5mph End 8-10 mph | Wind Direction: Start N End ✓

Ambient Temp.: Start 72°F End 76°F | Wet Bulb Temp.: | RH Percent: 78%

Source Layout Sketch

Draw North Arrow: ☐ TN ☐ MN



Longitude | Latitude | Declination

Additional Information: rain stopped, cloudy

Observation Date	Time Zone	Start Time	End Time
7/14/99	Cent.	10:58	11:28

Min \ Sec	0	15	30	45	Comments
1	10	10	10	10	scattered rain/rain
2	5	10	5	10	stopped
3	10	5	10	10	
4	5	5	10	5	
5	5	5	5	5	
6	0	5	5	5	
7	10	5	5	5	
8	5	5	0	5	
9	5	0	5	5	
10	5	5	5	5	
11	5	0	5	5	
12	0	5	5	5	
13	5	5	0	5	
14	0	5	0	5	
15	0	0	5	0	
16	0	0	0	5	
17	0	5	0	0	
18	5	5	0	5	
19	0	5	0	0	
20	5	0	5	0	
21	5	0	0	0	
22	0	0	0	0	
23	0	0	0	0	
24	0	0	5	0	sun peaking through
25	0	0	0	5	clouds
26	0	0	0	5	
27	0	0	5	0	
28	5	0	0	0	
29	0	0	0	0	
30	0	0	0	0	

Observer's Name (Print): Michael Smith

Observer's Signature: Michael N. Smith | Date: 7/14/99

Organization: Interspoll Labs

Certified By: Eastern Technical Assoc | Date: ~~4/07/99~~ 4/1/99

VEOF1.1

EPA

VISIBLE EMISSION OBSERVATION FORM 1

Form Number	Page	of
1.1	2	2

Continued on VEO Form Number:

Method Used (Circle One): Method 9 | 203A | 203B | Other: _____

Company Name: American Asphalt

Facility Name: Plant #41

Street Address: County V

City: Hartley | State: MN | Zip:

Process: | Unit #: | Operating Mode:

Control Equipment: | Operating Mode:

Describe Emission Point:

Height of Emiss. Pt.: Start | End | Height of Emiss. Pt. Rel. to Observer: Start | End

Distance to Emiss. Pt.: Start | End | Direction to Emiss. Pt. (Degrees): Start | End

Vertical Angle to Obs. Pt.: Start | End | Direction to Obs. Pt. (Degrees): Start | End

Distance and Direction to Observation Point from Emission Point: Start | End

Describe Emissions: Start | End

Emission Color: Start | End | Water Droplet Plume: Attached ☐ Detached ☐ None ☐

Describe Plume Background: Start | End

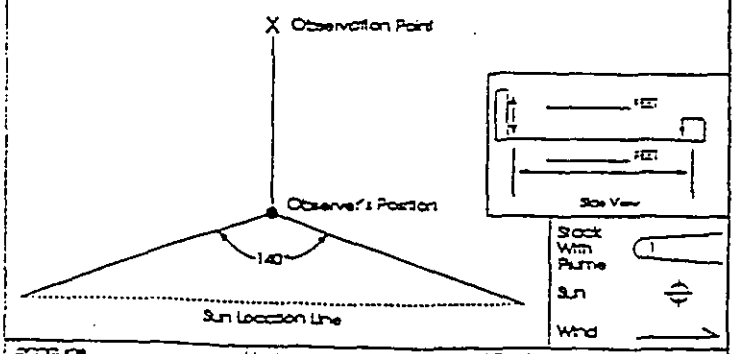
Background Color: Start | End | Sky Conditions: Start | End

Wind Speed: Start | End | Wind Direction: Start | End

Ambient Temp.: Start | End | Wet Bulb Temp. | RH Percent

Source Layout Sketch

Draw North Arrow ☐ TN ☐ MN



Longitude | Latitude | Declination

Additional Information: mostly sunny

Observation Date	Time Zone	Start Time	End Time
7/14/99	cent	11:28	11:58

Min \ Sec	0	15	30	45	Comments
1	0	0	0	0	clearing sky
2	0	0	0	0	
3	0	0	0	0	
4	0	0	5	0	
5	5	5	5	5	
6	5	0	0	5	
7	5	5	5	0	
8	5	5	5	5	
9	0	0	0	5	
10	0	5	5	5	
11	0	0	0	0	
12	0	0	5	5	
13	0	5	0	0	
14	0	0	0	0	
15	0	0	0	0	
16	0	0	0	0	
17	0	0	0	0	
18	0	0	0	0	
19	0	0	0	0	sunny
20	0	5	0	0	
21	0	0	0	0	
22	0	0	0	0	
23	0	0	0	0	
24	0	0	0	0	
25	0	0	0	0	
26	0	0	0	0	
27	0	0	0	0	
28	5	0	0	0	
29	0	0	0	0	
30	0	0	0	0	

Observer's Name (Print): Michael Smith

Observer's Signature: Michael D. Smith | Date: 7/14/99

Organization: Interpoll Labs

Certified by: | Date:

VEOF1.1

APPENDIX D

INTERPOLL LABORATORIES ANALYTICAL DATA

INTERPOLL LABORATORIES, INC.
(612) 786-6020

GRAVIMETRICS DATA SHEET

Job: Mathy
Date Collected: 7/14/99
Date of Analysis: 7/28/99

Source: Plant #41
Test No.: 1
Technician: D. Van Hoever

Probe Wash Data
Solvent Used: Acetone

Filter Data
Filter Type: 4" glass fiber

Run 0			
Log # 13123-01	Dish # 45	Log # 13123-05	Filter # 975
Volume 105 ml	Leakage X no, ___ yes	Color	
Tare + Sample (g)	52.1399	Tare + Sample (g)	.9451
Tare (g)	52.1398	Tare (g)	.9452
Sample (g)	.0001	Sample (g)	.0001
Run 1			
Log # -02	Dish # 69	Log # -06	Filter # 977
Volume 65 ml	Leakage X no, ___ yes	Color	
Tare + Sample (g)	46.2323	Tare + Sample (g)	.9427
Tare (g)	46.2213	Tare (g)	.9245
Sample (g)	.0110	Sample (g)	.0182
Run 2			
Log # -03	Dish # 41	Log # -07	Filter # 940
Volume 60 ml	Leakage X no, ___ yes	Color	
Tare + Sample (g)	45.3292	Tare + Sample (g)	.9375
Tare (g)	45.3183	Tare (g)	.9162
Sample (g)	.0109	Sample (g)	.0213
Run 3			
Log # -04	Dish # 62	Log # -08	Filter # 984
Volume 60 ml	Leakage X no, ___ yes	Color	
Tare + Sample (g)	50.8946	Tare + Sample (g)	.9460
Tare (g)	50.8870	Tare (g)	.9243
Sample (g)	.0076	Sample (g)	.0217

Note: Solvent residue must be less than 0.0000078 g/ml

Blank Corr. P.W. .0109 .0108 .0075

	Run 1	Run 2	Run 3	Run
Results of Filter + Probe Wash (g)	.0291	.0321	.0292	
Total Mass (g)				

010397-G:\STACK\WP\FORMS\S-491

INTERPOLL LABORATORIES, INC.
(612) 786-6020

Sample Chain of Custody

Job: Mathy
Field Engineer: Scott Fjelsta
Source: Plant #41
Date of Test: 7/14/99
Site: Stack
Test No.: 1
Log No.: 13123
No. of Runs: 3

No. Items	Sample Type		Analysis		Sequence No.	Comments
4	**Probe Wash:** ☒ Acetone ☐ $MeCl_2$	☐ DI Water ☐ _____	☒ EPA M-5 ☐ EPA M-29	☐ EPA M-201A ☐ _____	01-04	
4	**Filter:** ☒ 4" Glass ☐ SS Thimble	☐ Pallflex ☐ 2.5" Glass	☒ EPA M-5 ☐ EPA M-29 ☐ EPA M-201A	☐ EPA M-17	05-08	
	Impingers: ☐ DI Water ☐ 3% H_2O_2 ☐ 1N NaOH ☐ 2,4-DNPH	☐ H_2SO_4 ☐ HNO_3/H_2O_2 ☐ $KMnO_4/H_2SO_4$ ☐ _____	☐ MN Protocol ☐ WI Protocol ☐ EPA M-202 ☐ EPA M6,8 ☐ Acid Gases	☐ IA Protocol ☐ Formaldehyde ☐ EPA M-29 ☐ EPA M-26 ☐ _____		
	Integrated Gas: ☐ Tedlar Bag	☐ _____	☐ EPA M-3 ☐ _____	☐ EPA M-10		
	Oxides of Nitrogen:		☐ EPA M-7A ☐ _____			
1	**Fuel Lab:** ☒ Fuel Sample	☐ Aggregate	☐ Per S-0163	Short Prox + Density	09	See proposal
	Particle Sizing:		☐ X-Ray Sdgraph ☐ _____	☐ Cascade Imp		
	Miscellaneous:	☐ _____	☐ _____			

Fuel Type:
Coal: ☐ Bituminous ☐ Anthracite ☐ Lignite
Wood: ☐ Wood Waste ☐ Dust ☐ Bark
Oil: ☒ Waste Oil ☐ No. 2 ☐ No. 6
Misc: ☐ Natural Gas ☐ RDF ☐ _____

Relinquished by/Affiliation	Accepted by/Affiliation	Date
Scott Fjelsta Interpoll Labs	[illegible]	7/26/99

033094-G:\STACK\WP\FORMS\S-278.2

APPENDIX E

COMPUTER DATALOGGER PRINTOUTS

Mathy Construction
Hately, WI
Plant NO. 41 Stack
7/14/99
Run 1

Time	SO2 ppm, w	O2 %, d	CO2 %, w
8:00 AM	42.68	11.97	4.55
8:01 AM	44.28	11.79	4.63
8:02 AM	43.29	11.89	4.51
8:03 AM	43.03	11.90	4.67
8:04 AM	42.68	11.89	4.61
8:05 AM	42.67	11.92	4.57
8:06 AM	40.96	11.93	4.49
8:07 AM	40.06	11.99	4.45
8:08 AM	42.56	12.02	4.68
8:12 AM	38.15	12.83	4.39
8:13 AM	38.18	12.66	4.47
8:14 AM	38.01	12.57	4.43
8:15 AM	37.65	12.66	4.33
8:16 AM	38.09	12.44	4.36
8:17 AM	37.21	12.35	4.32
8:18 AM	37.90	12.17	4.49
8:19 AM	38.88	12.02	4.63
8:20 AM	38.84	12.03	4.56
8:21 AM	39.97	12.02	4.60
8:22 AM	41.28	12.01	4.57
8:23 AM	43.34	11.97	4.65
8:24 AM	43.79	11.95	4.75
8:25 AM	43.32	11.90	4.68
8:26 AM	43.07	11.80	4.69
8:27 AM	43.00	11.62	4.69
8:28 AM	43.38	11.64	4.69
8:29 AM	44.23	11.70	4.79
8:30 AM	44.87	11.71	4.76
8:31 AM	45.08	11.62	4.76
8:32 AM	44.68	11.68	4.69
8:33 AM	44.08	11.67	4.69
8:34 AM	43.63	11.67	4.84
8:35 AM	42.80	11.74	4.73
8:36 AM	43.51	11.61	4.75
8:37 AM	43.86	11.61	4.75
8:38 AM	43.99	11.72	4.66
8:39 AM	44.34	11.69	4.79
8:40 AM	44.21	11.70	4.75
8:41 AM	44.33	11.59	4.76
8:42 AM	44.04	11.54	4.77

8:43 AM	42.24	11.52	4.70
8:44 AM	42.16	11.58	4.86
8:45 AM	42.84	11.66	4.78
8:46 AM	43.07	11.62	4.76
8:47 AM	41.86	11.61	4.71
8:48 AM	40.95	11.63	4.64
8:49 AM	42.20	11.55	4.82
8:50 AM	42.33	11.60	4.79
8:51 AM	42.27	11.68	4.70
8:52 AM	41.70	11.64	4.64
8:53 AM	41.59	11.61	4.64
8:54 AM	41.30	11.60	4.80
8:55 AM	41.81	11.59	4.76
8:56 AM	41.92	11.52	4.74
8:57 AM	42.51	11.49	4.74
8:58 AM	43.11	11.48	4.69
8:59 AM	44.18	11.42	4.82
9:00 AM	43.49	11.40	4.81
9:01 AM	42.66	11.50	4.73
9:02 AM	42.26	11.52	4.71
Average	42.17	11.81	4.66

Mathy Construction
Hatley, WI
Plant No. 41 Stack

7/14/99
Test 1 Run 1

VOLUMETRIC FLOW RATE
NUMBER OF SAMPLE POINTS 30

PT. NO.		DELTA P	SQ. RT P	TEMP	TIME
1	A-1	1.2	1.095	259.1	8:00 AM
2	-2	1.35	1.162	259.1	
3	-3	1.4	1.183	259.1	
4	-4	1.35	1.162	259.1	
5	-5	1.2	1.095	259.1	
6	B-1	1.2	1.095	259.1	
7	-2	1.4	1.183	259.1	
8	-3	1.45	1.204	259.1	
9	-4	1.2	1.095	259.1	
10	-5	1.15	1.072	259.1	
11	C-1	1.3	1.14	259.1	
12	-2	1.4	1.183	259.1	
13	-3	1.3	1.14	259.1	
14	-4	1.5	1.225	259.1	
15	-5	1.4	1.183	259.1	
16	D-1	.76	.872	259.1	
17	-2	1.3	1.14	259.1	
18	-3	1.5	1.225	259.1	
19	-4	1.1	1.049	259.1	
20	-5	1.1	1.049	259.1	
21	E-1	.47	.686	259.1	
22	-2	.57	.755	259.1	
23	-3	1.1	1.049	259.1	
24	-4	.93	.964	259.1	
25	-5	.81	.9	259.1	
26	F-1	.34	.583	259.1	
27	-2	.56	.748	259.1	
28	-3	.59	.768	259.1	
29	-4	.57	.755	259.1	
30	-5	.45	.671	259.1	
AVERAGE		1.065	1.014	259.1	

MOISTURE CONTENT	DATA	FLOW RATE	
METER VOLUME	45.35	STATIC PRESSURE	-.94
AVERAGE METER TEMP	66.1	PITOT COEF.	0.84
GAS METER COEF. (Y)	0.9972		
GAS METER DELTA H@	1.79	DUCT WIDTH(IN)	73
GRAMS OF WATER	405.	DUCT LENTGH(IN)	27
BAROMETRIC PRESSURE	28.56	DUCT AREA (SQ.FT.)	13.688
		STACK DIA. (IN)	.
STANDARD METER VOLUME	43.506	STACK AREA (SQ.FT.)	.
MOISTURE CONTENT	30.481		

		MOLECULAR WEIGHT (DRY)	29.495
OXYGEN %	11.747	MOLECULAR WEIGHT (WET)	25.991
CO 2 %	6.408	STACK PRESSURE	28.491
		FEET PER SECOND	71.788
STANDARD CFH	2,473,251	ACTUAL CFM	58956.
K STANDARD CFM	41.221	DRY STANDARD CFM	28656.22

Mathy Construction **7/14/99**
Hatley, WI **Test 1** **Run 1**
Plant No. 41 Stack

FIELD CALCULATIONS

RAW DATA TABLE

INSTRUMENT	PPM OR %	ZERO	SPAN	GAS	C GAS	
O2 (dry)	11.81	0.09	11.07	11.	**11.75**	dry
CO2 (wet)	4.66	0.14	11.20	10.9	**4.45**	wet
SO2 (wet)	42.17	0.39	89.20	89.8	**42.25**	wet

MOISTURE	30.48	STANDARD CFH	2,473,251
FUEL FACTOR C	.	K STANDARD CFM	41.221
DSCFM	28656.2		

RESULTS

O2 % (dry)	11.75		
CO2 % (dry)	6.41		
SO2 (dry)	**60.77**	**SO2 LBS/HR**	**17.342**
		Fo	1.428

Mathy Construction
Hately, WI
Plant NO. 41 Stack
7/14/99
Run 2

Time	SO2 ppm, w	O2 %, d	CO2 %, w
9:30 AM	44.83	11.36	4.73
9:31 AM	44.37	11.39	4.73
9:32 AM	44.14	11.48	4.64
9:33 AM	44.98	11.30	4.72
9:34 AM	44.66	11.45	4.68
9:35 AM	43.17	11.55	4.73
9:36 AM	43.01	11.58	4.65
9:37 AM	43.11	11.61	4.63
9:38 AM	43.06	11.61	4.62
9:39 AM	43.03	11.58	4.58
9:40 AM	41.11	11.80	4.71
9:44 AM	42.54	11.72	4.58
9:45 AM	44.01	11.60	4.74
9:46 AM	43.95	11.49	4.70
9:47 AM	43.68	11.49	4.72
9:48 AM	42.99	11.46	4.66
9:49 AM	41.78	11.53	4.59
9:50 AM	41.75	11.52	4.75
9:51 AM	41.09	11.56	4.72
9:52 AM	40.97	11.58	4.64
9:53 AM	40.76	11.60	4.57
9:54 AM	41.46	11.54	4.51
9:55 AM	43.38	11.54	4.73
9:56 AM	43.44	11.50	4.76
9:57 AM	42.90	11.46	4.69
9:58 AM	42.03	11.48	4.63
9:59 AM	41.95	11.50	4.59
10:00 AM	42.34	11.51	4.71
10:01 AM	42.57	11.52	4.80
10:02 AM	41.46	11.52	4.71
10:03 AM	40.46	11.53	4.65
10:04 AM	41.55	11.33	4.73
10:05 AM	44.20	11.38	4.87
10:06 AM	45.41	11.36	4.91
10:07 AM	44.08	11.42	4.81
10:08 AM	42.77	11.43	4.70
10:09 AM	41.56	11.43	4.65
10:10 AM	41.94	11.42	4.75
10:11 AM	43.30	11.45	4.82
10:12 AM	42.99	11.43	4.80

10:13 AM	43.47	11.43	4.78
10:14 AM	42.96	11.43	4.67
10:15 AM	43.54	11.45	4.74
10:16 AM	43.81	11.48	4.85
10:17 AM	43.48	11.48	4.77
10:18 AM	42.33	11.44	4.73
10:19 AM	42.59	11.41	4.69
10:20 AM	42.98	11.43	4.70
10:21 AM	43.64	11.43	4.85
10:22 AM	42.86	11.56	4.76
10:23 AM	41.33	11.85	4.59
10:24 AM	39.89	11.88	4.55
10:25 AM	39.25	11.69	4.60
10:26 AM	38.62	11.79	4.70
10:27 AM	38.22	11.89	4.59
10:28 AM	38.18	11.94	4.51
10:29 AM	38.27	11.93	4.51
10:30 AM	37.04	11.86	4.48
10:31 AM	36.87	11.95	4.59
10:32 AM	37.70	11.97	4.54
Average	**42.16**	**11.55**	**4.68**

Mathy Construction 7/14/99
Hatley, WI Test 1 Run 2
Plant No. 41 Stack

VOLUMETRIC FLOW RATE
NUMBER OF SAMPLE POINTS 30

PT. NO.		DELTA P	SQ. RT P	TEMP	TIME
1	A-1	1.20	1.095	257.4	9:30 AM
2	-2	1.20	1.095	257.4	
3	-3	1.45	1.204	257.4	
4	-4	1.50	1.225	257.4	
5	-5	1.45	1.204	257.4	
6	B-1	1.30	1.14	257.4	
7	-2	1.40	1.183	257.4	
8	-3	1.50	1.225	257.4	
9	-4	1.50	1.225	257.4	
10	-5	1.40	1.183	257.4	
11	C-1	0.92	.959	257.4	
12	-2	0.90	.949	257.4	
13	-3	0.60	.775	257.4	
14	-4	1.45	1.204	257.4	
15	-5	1.40	1.183	257.4	
16	D-1	0.73	.854	257.4	
17	-2	1.40	1.183	257.4	
18	-3	1.50	1.225	257.4	
19	-4	1.30	1.14	257.4	
20	-5	0.98	.99	257.4	
21	E-1	0.80	.894	257.4	
22	-2	0.92	.959	257.4	
23	-3	1.05	1.025	257.4	
24	-4	1.10	1.049	257.4	
25	-5	0.75	.866	257.4	
26	F-1	0.29	.539	257.4	
27	-2	0.61	.781	257.4	
28	-3	0.64	.8	257.4	
29	-4	0.52	.721	257.4	
30	-5	0.40	.632	257.4	10:32 AM
AVERAGE		1.07	1.02	257.4	

MOISTURE CONTENT	DATA	FLOW RATE	
METER VOLUME	46.07	STATIC PRESSURE	-0.94
AVERAGE METER TEMP	70.	PITOT COEF.	0.84
GAS METER COEF. (Y)	0.9972		
GAS METER DELTA H AT	1.79	DUCT WIDTH(IN)	73
GRAMS OF WATER	475.	DUCT LENTGH(IN)	27
BAROMETRIC PRESSURE	28.56	DUCT AREA (SQ.FT.)	13.6875
		STACK DIA. (IN)	0
STANDARD METER VOLUME	43.871	STACK AREA (SQ.FT.)	0.0000
MOISTURE CONTENT	33.773		

		MOLECULAR WEIGHT (DRY)	29.553
OXYGEN %	11.511	MOLECULAR WEIGHT (WET)	25.651
CO 2 %	6.83	STACK PRESSURE	28.491
		FEET PER SECOND	72.355
STANDARD CFH	2,498,684	ACTUAL CFM	59421.45
K STANDARD CFM	41.645	DRY STANDARD CFM	27580.02

Mathy Construction **7/14/99**
Hatley, WI **Test 1** **Run 2**
Plant No. 41 Stack

FIELD CALCULATIONS

RAW DATA TABLE

INSTRUMENT	PPM OR %	ZERO	SPAN	GAS	C GAS	
O2 (dry)	11.55	0.07	11.04	11	**11.51**	dry
CO2 (wet)	4.68	0.14	11.08	10.9	**4.52**	wet
SO2 (wet)	42.16	0.55	88.50	89.8	**42.49**	wet

MOISTURE	33.77	STANDARD CFH	2,498,684
FUEL FACTOR C	0	K STANDARD CFM	41.645
DSCFM	27580		

RESULTS

O2 % (dry)	11.51		
CO2 % (dry)	6.83		
SO2 ppm (dry)	**64.15**	**SO2 LBS/HR**	**17.62**
		Fo	1.375

Mathy Construction
Hately, WI
Plant NO. 41 Stack
7/14/99
Run 3

Time	SO2 ppm, w	O2 %, d	CO2 %, w
10:55 AM	41.90	12.12	4.46
10:56 AM	43.16	12.03	4.57
10:57 AM	42.30	12.03	4.53
10:58 AM	41.33	11.96	4.47
10:59 AM	40.58	11.96	4.45
11:00 AM	39.67	11.96	4.39
11:01 AM	39.25	12.05	4.47
11:02 AM	38.52	12.12	4.43
11:03 AM	38.38	12.10	4.41
11:04 AM	38.15	12.07	4.39
11:05 AM	37.65	12.12	4.32
11:08 AM	38.82	12.39	4.43
11:09 AM	40.29	12.12	4.48
11:10 AM	40.30	12.09	4.44
11:11 AM	40.56	12.09	4.54
11:12 AM	39.11	12.12	4.47
11:13 AM	38.68	12.21	4.41
11:14 AM	39.25	12.21	4.41
11:15 AM	39.93	12.12	4.46
11:16 AM	41.03	12.05	4.54
11:17 AM	40.87	12.15	4.50
11:18 AM	40.36	12.20	4.40
11:19 AM	40.10	12.14	4.40
11:20 AM	39.97	12.15	4.37
11:21 AM	40.50	12.22	4.47
11:22 AM	40.06	12.17	4.48
11:23 AM	40.03	12.10	4.45
11:24 AM	39.58	12.04	4.44
11:25 AM	39.40	12.04	4.39
11:26 AM	39.05	12.27	4.39
11:27 AM	38.33	12.34	4.42
11:28 AM	36.78	12.38	4.32
11:29 AM	36.58	12.33	4.29
11:30 AM	35.47	12.32	4.28
11:31 AM	35.56	12.39	4.33
11:32 AM	35.73	12.31	4.47
11:33 AM	34.73	12.32	4.41
11:34 AM	34.68	12.34	4.38
11:35 AM	34.43	12.40	4.31
11:36 AM	35.57	12.34	4.42

11:37 AM	36.88	12.36	4.50
11:38 AM	37.08	12.32	4.42
11:39 AM	36.55	12.29	4.35
11:40 AM	35.98	12.43	4.33
11:41 AM	36.41	12.31	4.37
11:42 AM	36.99	12.26	4.57
11:43 AM	36.16	12.39	4.42
11:44 AM	36.35	12.43	4.33
11:45 AM	35.68	12.38	4.29
11:46 AM	35.93	12.34	4.29
11:47 AM	36.78	12.26	4.53
11:48 AM	36.19	12.30	4.41
11:49 AM	35.47	12.40	4.31
11:50 AM	34.80	12.42	4.30
11:51 AM	35.03	12.45	4.29
11:52 AM	36.16	12.40	4.44
11:53 AM	35.21	12.41	4.35
11:54 AM	34.80	12.37	4.29
11:55 AM	34.47	12.40	4.26
11:56 AM	34.24	12.39	4.28
Average	**37.90**	**12.24**	**4.41**

Mathy Construction 7/14/99
Hatley, WI Test 1 Run 3
Plant No. 41 Stack

VOLUMETRIC FLOW RATE
NUMBER OF SAMPLE POINTS 30

PT. NO.		DELTA P	SQ. RT P	TEMP	TIME
1	A-1	.78	.883	254.3	10:55 AM
2	-2	1.1	1.049	254.3	
3	-3	1.3	1.14	254.3	
4	-4	1.3	1.14	254.3	
5	-5	1.2	1.095	254.3	
6	B-1	1.1	1.049	254.3	
7	-2	1.2	1.095	254.3	
8	-3	1.4	1.183	254.3	
9	-4	1.35	1.162	254.3	
10	-5	1.2	1.095	254.3	
11	C-1	1.1	1.049	254.3	
12	-2	1.7	1.304	254.3	
13	-3	1.6	1.265	254.3	
14	-4	1.5	1.225	254.3	
15	-5	1.35	1.162	254.3	
16	D-1	1.6	1.265	254.3	
17	-2	1.2	1.095	254.3	
18	-3	1.6	1.265	254.3	
19	-4	1.4	1.183	254.3	
20	-5	1.3	1.14	254.3	
21	E-1	.62	.787	254.3	
22	-2	.95	.975	254.3	
23	-3	1.2	1.095	254.3	
24	-4	.9	.949	254.3	
25	-5	.71	.843	254.3	
26	F-1	.38	.616	254.3	
27	-2	.48	.693	254.3	
28	-3	.64	.8	254.3	
29	-4	.54	.735	254.3	
30	-5	.48	.693	254.3	
AVERAGE		1.106	1.034	254.3	

MOISTURE CONTENT	DATA	FLOW RATE	
METER VOLUME	44.05	STATIC PRESSURE	-0.94
AVERAGE METER TEMP	63.9	PITOT COEF.	0.84
GAS METER COEF. (Y)	0.9972		
GAS METER DELTA H AT	1.79	DUCT WIDTH(IN)	73
GRAMS OF WATER	419.	DUCT LENTGH(IN)	27
BAROMETRIC PRESSURE	28.56	DUCT AREA (SQ.FT.)	13.6875
		STACK DIA. (IN)	0
STANDARD METER VOLUME	43.871	STACK AREA (SQ.FT.)	0
MOISTURE CONTENT	31.027		

		MOLECULAR WEIGHT (DRY)	29.483
OXYGEN %	12.323	MOLECULAR WEIGHT (WET)	25.92
CO 2 %	6.185	STACK PRESSURE	28.491
		FEET PER SECOND	73.054
STANDARD CFH	2,533,769	ACTUAL CFM	59995.43
K STANDARD CFM	42.229	DRY STANDARD CFM	29127.02

Mathy Construction **7/14/99**
Hatley, WI **Test 1** **Run 3**
Plant No. 41 Stack

FIELD CALCULATIONS

RAW DATA TABLE

INSTRUMENT	PPM OR %	ZERO	SPAN	GAS	C GAS	
O2 (dry)	12.24	0.04	10.93	11	**12.32**	dry
CO2 (wet)	4.41	0.14	11.05	10.9	**4.27**	wet
SO2 (wet)	37.9	0.68	88.55	89.8	**38.04**	wet

MOISTURE	31.03	STANDARD CFH	2,533,769
FUEL FACTOR C	1460	K STANDARD CFM	42.229
DSCFM	29127		

RESULTS

O2 % (dry)	12.32		
CO2 % (dry)	6.19		
SO2 ppm (dry)	**55.15**	**SO2 LBS/HR**	**15.997**

APPENDIX F

GAS ANALYZER SPECIFICATIONS

INTERPOLL LABORATORIES
4500 BALL ROAD N.E.
CIRCLE PINES, MN 55014-1819
(612) 786-6020

Servomex

1420
Oxygen Analyser
Instruction Manual

Ref : 01420/001A/0

Order as part No. 01420001A

was (7982-2842)

INTERPOLL LABORATORIES
4500 BALL ROAD N.E.
CIRCLE PINES, MN 55014-1819
(612) 786-6020

1.3 Sampling System

The sampling system of the analyser includes a combination filter/automatic flow control device, designed to keep a constant flow of sample gas through the measuring cell for varying input pressures and to prevent the entrance of particulate matter into the measuring cell. Excess flow is vented to the by-pass.

1.4 Specification

Performance Specification (typical)

Repeatability:	Better than +/-0.2% O2 under constant conditions.
Drift:	Less than 0.2% O2 per week under constant conditions. (Excluding variation due to barometric pressure changes; reading is proportional to barometric pressure.)

Outputs

Display:	3 1/2 digit LCD reading 0.0 to 100.0% oxygen with overrange capability.
Output:	0 to 1V (non-isolated) for 0 to 100% oxygen available on 'D' type connector located on the back panel of the instrument. Output impedance is less than 10 ohms.
Option:	4 - 20mA isolated, Max impedance 500 ohms.
Flow alarm output:	Change over relay contact rated at 3A/115V ac, 1A/240V ac or 1A/28V dc. 4 sets of single pole changeover contacts. Alarm becomes active when sample gas flow through the analyser fails.

Sample requirements

Condition:	Clean, dry gas with dew point 5 deg C below ambient temperature.
Inlet pressure:	0.5 to 3psig (3.5 to 21kPa). Inlet pressure changes within this range will change the reading by less than 0.1% O2. May be operated up to 10psig (70kPa) with degraded stability.
Flowrate:	1.5 to 6 litres/minute approximately depending on sample pressure.
Filtering:	0.6 micron replaceable filter integral to the automatic flow control device.

Response time:	Less than 15 secs. to 90% at an inlet pressure of 3psig (21kPa).
Inlet/vent connections:	1/4 inch OD tube (stainless steel) suitable for 6mm ID flexible tubing or 1/4 inch OD compression fittings.
Materials exposed to the sample:	Stainless steel, Pyrex glass, brass, platinum, epoxy resin, Viton, polypropylene and glass fibre filter.

Physical Characteristics

Case:	Steel and aluminium finished in epoxy powder paint.
Case classification:	IP 20 (IEC 529) when fitted into the Servomex 1400 series 19 inch case.
Dimensions:	See Figure 2.1.
Weight:	10Kg (22lb) approximately.

Electrical

AC Supply:	110 to 120V AC or 220 to 240V AC, +/-10%, 48 to 62Hz. Voltage selected by a voltage selector integral to the IEC supply plug.
Power required:	15VA maximum.

Environmental Limits

Operating ambient temperature:	0 to +40 deg C (32 to 104 deg F)
Storage temp. range:	-20 to +70 deg C (-4 to 158 deg F)
Relative humidity:	0-85%, non-condensing.

II. SPECIFICATIONS

MODEL 43B PULSED FLUORESCENCE SO2 ANALYZER

Ranges	
Standard Mode	0-0.1, 0.2, 0.5, 1, 2, 5, and 10 ppm
High Range Mode	0-1, 2, 5, 10, 20, 50, and 100 ppm

Signal Averaging Time For:	10 SEC	60 SEC	300 SEC
Noise (RMS value when sampling zero air)	1.0 ppb	0.5 ppb	0.25 ppb
Lower Detectable Limit (LDL)	2.0 ppb	1.0 ppb	0.5 ppb
Analyzer Response Time	80 sec	110 sec	320 sec

Linearity	±1 % of fullscale
Precision	1% of Reading or 1 ppb
Zero Drift	Less than 1 ppb per day
Span Drift	± 1% per day
Interferences per EPA levels	Less than LDL except for the following
NO	Less than 3 ppb
M-Xylene	Less than 2 ppb
H_2O	Less than 2% of reading
Temperature Dependence	
Zero	± 0.1 ppb/°C
Span	± 0.1% / °C
Flow	0.5 LPM (Standard), 1 LPM (optional)
Standard Output	Dual: Selectable Voltage
Optional: Two additional analog outputs	Selectable Voltage, 4-20 mA isolated, 4-20 mA non-isolated
Optional: Digital Output	RS-232
Line Power	115 V/60 Hz and 220 V/50 Hz versions
Average Power Consumption	100 Watts
Maximum Steady A.C. Line Current	1.3 Amp (115 V)
Size and Weight	17"W x 8 3/4"H x 23"D 44 lbs.

C. SPECIFICATIONS

Ranges	Model 41	0-0.2, 0.5, 1.0, 2, 5, 10, 20, 100, 200 PPM
	Model 41H	0-5, 10, 20, 50, 100, 200, 500, 2000, 5000 PPM
Noise	Model 41	3 PPB RMS - with time constant of 5 minutes
	Model 41H	50 PPB RMS - with time constant of 5 minutes
Minimum Detectable Limit	Model 41	5 PPB
	Model 41H	100 PPB
Zero Drift, 24 hours	Model 41	+/- 0.02 PPM
	Model 41H	+/- 0.05 PPM
Span Drift, 24 hours		+/- 2% Full Scale
Rise, Fall Times (0-95%) (at 1 lpm flow, 30 second response time)		1.5 Minutes
Precision		±1%
Linearity		+/- 1.5%
Flow Rate		0.5 - 2 lpm
Rejection Ratio		Negligible interference from water and CO
Operating Temperature		Performance specifications maintained over the range 15-35°C (may be operated safely over the range 5-45°C)
Power Requirements		100 Watt at 105 to 125 VAC, 60 Hz or 200 to 240 VAC, 50 Hz 100 Watts
Physical Dimensions		17"W x 8 3/4"H x 23"D
Weight		45 lbs.
Dual Outputs (Standard)		Individually selectable to 0-10mv, 0-100mv, 0-1V, 0-5V, 0-10V, digital display, 1 hour integrated value. Other outputs available upon request (4-20ma)

APPENDIX G

MEASUREMENT SYSTEMS PERFORMANCE SPECIFICATIONS

Calibration Error

Mathy Construction
Hately, WI
Plant No. 41 Stack
7/14/99
Test 1

SO2 TEI Model 43B)

	Cylynder Value (ppm)	Analyzer Response (ppm)	Difference (ppm)	Span Value (ppm)	% of Span
Zero	0.00	0.55	0.55	200.00	0.28
Mid Level	89.80	89.72	0.08	200.00	0.04
High Level	134.00	132.32	1.68	200.00	0.84

CO2 (TEI Model 41H)

	Cylynder Value (ppm)	Analyzer Response (ppm)	Difference (ppm)	Span Value (ppm)	% of Span
Zero	0.00	0.14	0.14	20.00	0.70
Mid Level	11.00	11.22	0.22	20.00	1.10
High Level	21.00	16.50	4.50	20.00	22.50

O2 (Servomex Series 1400)

	Cylynder Value (ppm)	Analyzer Response (ppm)	Difference (ppm)	Span Value (ppm)	% of Span
Zero	0.00	0.10	0.10	25.00	0.40
Mid Level	10.90	10.98	0.08	25.00	0.32
High Level	16.60	20.98	4.38	25.00	17.52

**** All Calibrations must be within 2% of the span value...

Calibration Drift

Mathy Construction
Hatley, WI
Plant No. 41 Stack
7/14/99
Test 1

Calibration Start / Stop			O2 Initial	O2 Final	O2 Avg.				CO2 Initial	CO2 Final	CO2 Avg.				SO2 Initial	SO2 Final	SO2 Avg.	
9:10 AM	1	Zero	0.10	0.08	**0.09**		1	Zero	0.14	0.14	**0.14**		1	Zero	0.55	0.23	**0.39**	
9:25 AM		Upscale	10.98	11.15	**11.07**			Upscale	11.22	11.18	**11.20**			Upscale	89.72	88.68	**89.20**	
10:32 AM	2	Zero	0.08	0.06	**0.07**		2	Zero	0.14	0.14	**0.14**		2	Zero	0.23	0.87	**0.55**	
10:50 AM		Upscale	11.15	10.93	**11.04**			Upscale	11.18	10.98	**11.08**			Upscale	88.68	88.31	**88.50**	
11:57 AM	3	Zero	0.06	0.02	**0.04**		3	Zero	0.14	0.14	**0.14**		3	Zero	0.87	0.49	**0.68**	
12:10 PM		Upscale	10.93	10.93	**10.93**			Upscale	10.98	11.12	**11.05**			Upscale	88.31	88.78	**88.55**	

*** All Calibrations must be within 3% of the span value...

APPENDIX H

CALIBRATION GAS CERTIFICATION SHEETS

For Technical Information Call
1-800-752-1597

AIR PRODUCTS

Air Products and Chemicals, Inc. * 12722 S. Wentworth Avenue, Chicago, IL 60628

ISO CERTIFICATION: 9002

CERTIFICATE OF ANALYSIS: EPA PROTOCOL GAS STANDARD

PERFORMED ACCORDING TO EPA TRACEABILITY PROTOCOL FOR ASSAY AND CERTIFICATION OF GASEOUS CALIBRATION STANDARDS (PROCEDURE #G1)

Customer:
AIR PRODUCTS & CHEMICALS, INC.
373 CANTERBURY ROAD
SHAKOPEE MN 55379

Order No: CSS-109413-01
Batch No: 861-52469
PO:
Release:

Cylinder No: SG9148857BAL
Bar Code No: DGG814
Cylinder Pressure*: 2000 psig
Certification Date: 01/05/1999
Expiration Date: 01/05/2001

CERTIFIED CONCENTRATION		REFERENCE STANDARDS			ANALYTICAL INSTRUMENTATION			
Component	Certified Concentration	Cylinder Number	Standard Type	Standard Concentration	Instrument Make/Model	Serial Number	Last Calibration	Measurement Principal
SULFUR DIOXIDE	134 ±1.5 PPM	SG9151666BAL	GMIS R	252.9 PPM	HORIBA VIA-510	85079208	12/27/98	NON DISPERSIVE INFRARED
NITROGEN	Balance Gas							

* STANDARD SHOULD NOT BE USED BELOW 150 PSIG

Analyst: James Laas/PWD
James Laas

Approved By: Richard Fry/PWD
Richard Fry

(16921)

Pub No 3291 9/02

For Technical Information Call
1-800-752-1597

AIR PRODUCTS

Air Products and Chemicals, Inc. * 12722 S. Wentworth Avenue, Chicago, IL 60628

ISO CERTIFICATION: 9002

CERTIFICATE OF ANALYSIS: EPA PROTOCOL GAS STANDARD

PERFORMED ACCORDING TO EPA TRACEABILITY PROTOCOL FOR ASSAY AND CERTIFICATION OF GASEOUS CALIBRATION STANDARDS (PROCEDURE #G1)

Customer:
AIR PRODUCTS & CHEMICALS, INC.
373 CANTERBURY ROAD
SHAKOPEE MN 55379

Order No: CSS-838253-01
Batch No: 861-43720
PO: 26902
Release:

Cylinder No: SG9153312BAL
Bar Code No: DNN870
Cylinder Pressure*: 2000 psig
Certification Date: 12/15/97
Expiration Date: 12/15/99

CERTIFIED CONCENTRATION		REFERENCE STANDARDS			ANALYTICAL INSTRUMENTATION			
Component	Certified Concentration	Cylinder Number	Standard Type	Standard Concentration	Instrument Make/Model	Serial Number	Last Calibration	Measurement Principal
SULFUR DIOXIDE	89.8±1.76 PPM	SG9137979	GMIS R	253.6 PPM	HORIB VIA-510	85079208	12/04/97	NON DISPERSIVE INFRARED
NITROGEN	Balance Gas							

* STANDARD SHOULD NOT BE USED BELOW 150 PSIG

Analyst: James Laas

Approved By: Richard Fry /RVD
Richard Fry

NATIONAL SPECIALTY GASES
630 UNITED DRIVE
DURHAM, NC
27713
(919)544-3772

CERTIFICATE OF ANALYSIS * EPA PROTOCOL MIXTURES

REFERENCE #:	88-59508	CYLINDER #:	CC 46433	CYL. PRESSURE:	2000 PSIG	P.O. #:	28599
EXP. DATE:	8/17/01	LAST ANALYSIS DATE:	8/17/98	CUSTOMER:	TWIN CITY OXYGEN		

METHOD: ANALYZED ACCORDING TO EPA TRACEABILITY PROTOCOL FOR ASSAY AND CERTIFICATION OF GASEOUS CALIBRATION STANDARDS-SEPTEMBER 1997:0-1 THIS STANDARD SHOULD NOT BE USED WHEN ITS GAS PRESSURE IS BELOW 1.0 MEGAPASCALS (150 PSIG)

COMPONENT:	OXYGEN	COMPONENT:	CARBON DIOXIDE
STANDARD		STANDARD	
SRM #:	2659A	SRM #:	1675D
CYL. #:	CLM 6947	CYL. #	CLM 6481
CONC:	20.72 %	CONC:	14.01 %
INSTRUMENT:	BECKMAN PARAMAGNETIC	INSTRUMENT:	ROSEMOUNT NDIR
MODEL #:	755	MODEL #:	880A
SERIAL #:	1001419	SERIAL #:	2000418
LAST CAL.:	8/10/98	LAST CAL.:	8/9/98

MEAN CONC.:	21.0 %	+/-	0.17 %	MEAN CONC.:	16.6 %	+/-	0.13 %
REPLICATE CONC.				REPLICATE CONC.			
DATE:	8/17/98			DATE:	8/17/98		
21.0	%			16.6	%		
21.0	%			16.7	%		
21.1	%			16.6	%		

BALANCE GAS: NITROGEN

REPLICATE DATA						REPLICATE DATA						REPLICATE DATA					
DATE:	8/17/98					DATE:	8/17/98										
Z	0	R	20.7	C	21.0	Z	0	R	14.0	C	16.6						
R	20.7	Z	0	C	21.0	R	14.0	Z	0	C	16.7						
Z	0	C	21.1	R	20.7	Z	0	C	16.6	R	14.0						

Z= ZERO C=CANDIDATE R=REFERENCE

ANALYST: [signature] APPROVED BY: Richard Sykes

THIS REPORT STATED ACCURATELY THE RESULTS OF THE INVESTIGATION MADE UPON THE MATERIAL SUBMITTED TO THE ANALYTICAL LABORATORY. EVERY EFFORT HAS BEEN MADE TO DETERMINE CORRECTLY THE INFORMATION REQUESTED. HOWEVER, IN CONNECTION WITH THIS REPORT, NATIONAL SPECIALTY GASES SHALL HAVE NO LIABILITY IN EXCESS OF ITS ESTABLISHED CHARGE FOR THE SERVICE.

ASSAYED AT: NATIONAL SPECIALTY GASES, 630 UNITED DRIVE, DURHAM, NC 27713. (919)544-3772

NATIONAL SPECIALTY GASES
630 UNITED DRIVE
DURHAM, NC
27713
(919)544-3772

CERTIFICATE OF ANALYSIS * EPA PROTOCOL MIXTURES

REFERENCE #: 88-61728 CYLINDER #: CC 47620 CYL. PRESSURE: 2000 PSIG P.O. #: 29789
EXP. DATE: 2/15/02 LAST ANALYSIS DATE: 2/15/99 CUSTOMER: TWIN CITY OXYGEN
METHOD: ANALYZED ACCORDING TO EPA TRACEABILITY PROTOCOL FOR ASSAY AND CERTIFICATION OF GASEOUS CALIBRATION STANDARDS-SEPTEMBER 1997:G-1 THIS STANDARD SHOULD NOT BE USED WHEN ITS GAS PRESSURE IS BELOW 1.0 MEGAPASCALS (150 PSIG).

COMPONENT: OXYGEN	COMPONENT: CARBON DIOXIDE
STANDARD	STANDARD
SRM #: 2659A	SRM #: 1675B
CYL. #: CLM 6947	CYL. # CAL 014623
CONC: 20.72 %	CONC: 13.96%
INSTRUMENT: BECKMAN PARAMAGNETIC	INSTRUMENT: ROSEMOUNT NDIR
MODEL #: 755	MODEL #: 880A
SERIAL #: 1001419	SERIAL #: 2000418
LAST CAL.: 1/30/99	LAST CAL.: 2/4/99
MEAN CONC.: 11.0 % +/- 0.09 %	MEAN CONC.: 10.9 % +/- 0.09 %
REPLICATE CONC.	REPLICATE CONC.
DATE: 2/15/99	DATE: 2/15/99
11.0 %	10.9 %
11.0 %	10.9 %
11.0 %	11.0 %

BALANCE GAS: NITROGEN

REPLICATE DATA						REPLICATE DATA						REPLICATE DATA		
DATE: 2/15/99						DATE: 2/15/99								
Z	0	R	20.7	C	11.0	Z	0	R	14.0	C	10.9			
R	20.7	Z	0	C	11.0	R	14.0	Z	0	C	10.9			
Z	0	C	11.0	R	20.7	Z	0	C	11.0	R	14.0			

Z= ZERO C=CANDIDATE R=REFERENCE

ANALYST: Mara Jensen APPROVED BY: Steve Yu

THIS REPORT STATED ACCURATELY THE RESULTS OF THE INVESTIGATION MADE UPON THE MATERIAL SUBMITTED TO THE ANALYTICAL LABORATORY. EVERY EFFORT HAS BEEN MADE TO OBTAIN OBJECTIVELY THE INFORMATION REQUESTED; HOWEVER, IN CONNECTION WITH THIS REPORT, NATIONAL SPECIALTY GASES SHALL HAVE NO LIABILITY IN EXCESS OF ITS ESTABLISHED CHARGE FOR THE SERVICE. ASSAYED AT: NATIONAL SPECIALTY GASES, 630 UNITED DRIVE, DURHAM, NC 27713. (919)544-3772

APPENDIX I

PROCESS RATE INFORMATION

OPERATING DATA SUMMARY FOR ASPHALT PLANT SOURCES

Form OAS
01/29/

Test Date(s): 7-14-99

General:

P[redacted] Mfr. & Model No.: BARBER GREEN DM-70

This plant is (circle one): (Portable) Stationary

Type(circle all that apply): Batch Mix (Continuous Mix) (Parallel Flow Drum) Counterflow Drum

Other:

Pollution Control Equipment(circle one): (Baghouse) Venturi Scrubber Wet Scrubber Multiclone Cyclone If wet scrubbing:_____% scrubber water recycled

List Mfr. & Model No.: BARBER GREEN

Normal pressure drop range across control equipment is .16 TO .30 inches water

Was the control equipment operating normally during test?(circle one) (yes) no

If no, explain

Date & procedure of last maintenance/cleaning of control equipment: 4/15/99

Fuel, Material Processed, and Control Equipment Information:

Itemize all fuels and materials added to the combustion process during the test period. List fuel type used during testing (if oil, specify type) WASTE OIL If other units of measure are used, specify and calculate appropriate heat input.

What other types of fuel can be burned? NONE

Test [redacted]	Fuel Input (gal/hr)	Heat Content (Btu/gal-as received)	Heat Input (Btu/hr)	% Recycle[1] (If Used)	% - 200 fines	%Moisture of Virgin Aggregate Material
Run 1						
Run 2						
Run 3						

[1] %R= [(Recycle) ÷ (Aggregate + Recycle)]

Other Control Equipment Parameters	Design	During Testing		
Cleaning Cycles				
Air to Cloth Ratios				
No. of spray bars including delivery pressure				
No. of nozzles per spray bar				
		Run 1	Run 2	Run 3
pH				
Pond Depth (list units)				
Total Suspended Solids				

D[redacted]be the location of the thermocouples reading exiting dryer and mix temperature:

Note: All information required must be completed and submitted as part of the performance test. Failure to submit the required information will result in an incomplete performance test report.

Form OAS0
01/29/9

Time in 15 minute intervals	Virgin (V) Aggregate Material tons per hour	Recycle (R) Material tons per hour	Asphalt (A) Material tons per hour	Total Material Throughput (V+R+A) tons per hour	Temp. of Gases Exiting Dryer °F	Drum Mix Temp. °F	Dust Collector ΔP inches w.c.	Water Flow Rate gpm	Water Supply Pressure psig
8:00	246	—	14.3	260.3	305	294	6	—	—
8:15	252	—	14.7	266.7	297	286	5.5	—	—
8:30	263	—	15.0	278	309	296	6	—	—
8:45	272	—	15.8	287.8	299	284	5.5	—	—
9:00	271	—	15.7	286.7	296	278	5.5	—	—
	ttl = 261 tons								
9:30	273	—	15.9	288.9	297	275	5.5	—	—
9:45	275	—	16.0	291	300	281	5.75	—	—
10:00	274	—	16.0	290	295	277	5.75	—	—
10:15	275	—	16.0	291	301	283	5.75	—	—
10:30	275		16.0	291	287	267	5.25	—	—
	total 274 tons								
10:55	267	—	15.6	283.6	288	284	5.5	—	—
11:10	260	—	15.3	275.3	295	279	5.5	—	—
11:25	262	—	15.4	277.4	289	270	5.5	—	—
11:40	257	—	15.0	272	290	278	5.5	—	—
11:55	252	—	14.7	266.5	283	265	5.5	—	—
	total = 260 tons								
	295								
	total = ~~293~~ tons max								

Temp.-Temperature gpm-gallons per minute w.c.-water column °F-degrees Fahrenheit psi-pounds per square inch ΔP-pressure drop

@ 1.74 gallons/ton 1383 gallons waste oil

Environmental Programs Daily Tracking Form

Plant #: 41 Date: 7/14/99
Location: HATLEY
Plant Foreman: TERRY MANTOR

AIR QUALITY MONITORING

Production:

Total Asphalt Mix Tonnage: 2187.45
Diesel Fuel Gallons for Generator: 350
RAP % in mix: _____ RAP tons: 0
Mix Temperature (degrees F): 285°
Hours of Operation: 7.7

Process fuel:

Fuel Type: WASTE OIL Amt: 3804
Burner Pressure: 28# Fuel Temp: 165°
Fuel Type: _____ Amt: _____
Burner Pressure: _____ Fuel Temp: _____
Spec. Sheet Delivered: X yes _____ no

Baghouse:

Magnehelic dP: 5.5/6.0 inches of water
Photohelic dP: .28 .28 inches of water
Optimum photohelic range from burner tune-up: .16 TO .30 inches of water
Photohelic malfunction: _____ yes X no
(If yes, next day DNR notification required)
Weekly Inspection of drum and door seals, ducts, photohelic, damper, & other system parts: X yes _____ no
Maintenance Performed: _____

50,000 ton Blacklight Baghouse Inspection:
_____ yes _____ no
Number of Bags Replaced: _____

Fugitive Dust Control:

Control Measures: X yes _____ no
Water Amt. Applied: 1500 GAL
Chemical Amt. Applied: _____
Speed Limit Control (mph): 10

1.74 gallons for

Soil Remediation:

Soil Remediation Performed: _____ yes X no
Type: _____ commercial _____ own spill
Documented: _____ yes
(If yes, Complete Contaminated Soil Tracking form and Monthly Soil Remediation Summary form)

SPILL PREVENTION PLAN (SPCC)

Plant Inspection Conducted per SPCC Inspection Outline (Attachment # 9)
X yes _____ no
Systems Locked out: X yes _____ no
Petroleum Equipment Maintenance: _____

Weekly SPCC Meeting: X yes _____ no
Containment Water Released: _____ yes X no
(If yes, complete Water Drainage Form)

STORMWATER RUNOFF QUALITY

Best Mgmt. Practices (BMP) Applied: X yes _____ no
Petroleum Products Secure: X yes _____ no
Site Runoff Naturally Contained on Site:
X yes _____ no
If no, has containment been constructed:
_____ yes _____ no
Erosion Control Practices used (i.e. silt fence, site seeding, slopes): _____

Rain Amount in last 24 hrs: ½ inches
Any known Petro. Contamination: _____ yes X no
Sediment Content:
_____ Low _____ Medium _____ High
(Water Containment Drainage documentation is covered by SPCC)

To the best of my ability and to the extent that I am able to observe under the conditions of this site, I have due diligently completed this daily form. Signature means that the inspections have been completed and any observed deficiencies have been noted and communicated to the supervisors.

Plant Foreman's Signature:
Terry L. Mantor

APPENDIX J

PROCEDURES

5.1.4 **Gas Analyzer.** An analyzer to determine continuously the O_2 or CO_2 concentration in the sample gas stream. The analyzer shall meet the applicable performance specifications of Section 4. A means of controlling the analyzer flow rate and a device for determining proper sample flow rate (e.g., precision rotameter, pressure gauge downstream of all flow controls, etc.) shall be provided at the analyzer. The requirements for measuring and controlling the analyzer flow rate are not applicable if data are presented that demonstrate the analyzer is insensitive to flow variations over the range encountered during the test.

5.2 **Calibration Gases.** The calibration gases for CO_2 analyzers shall be CO_2 in N_2 or CO_2 in air. Alternatively, CO_2/SO_2, O_2/SO_2, or $O_2/CO_2/SO_2$ gas mixtures in N_2 may be used. Three calibration gases, as specified Section 5.3.1 through 5.3.3 of Method 6C, shall be used. For O_2 monitors that cannot analyze zero gas, a calibration gas concentration equivalent to less than 10 percent of the span may be used in place of zero gas.

6. Measurement System Performance Test Procedures

Perform the following procedures before measurement of emissions (Section 7).

6.1 **Calibration Concentration Verification.** Follow Section 6.1 of Method 6C, except if calibration gas analysis is required, use Method 3 and change the acceptance criteria for agreement among Method 3 results to 5 percent (or 0.2 percent by volume, whichever is greater).

6.2 **Interference Response.** Conduct an interference response test of the analyzer prior to its initial use in the field. Thereafter, recheck the measurement system if changes are made in the instrumentation that could alter the interference response (e.g., changes in the type of gas detector). Conduct the interference response in accordance with Section 5.4 of Method 20.

6.3 Measurement System Preparation, Analyzer Calibration Error, and Sampling System Bias Check. Follow Sections 6.2 through 6.4 of Method 6C.

7. Emission Test Procedure

7.1 **Selection of Sampling Site and Sampling Points.** Select a measurement site and sampling points using the same criteria that are applicable to tests performed using Method 3.

7.2 **Sample Collection.** Position the sampling probe at the first measurement point, and begin sampling at the same rate as used during the sampling system bias check. Maintain constant rate sampling (i.e., ± 10 percent) during the entire run. The sampling time per run shall be the same as for tests conducted using Method 3 plus twice the system response time. For each run, use only those measurements obtained after twice the response time of the measurement system has elapsed to determine the average effluent concentration.

7.3 **Zero and Calibration Drift Test.** Follow Section 7.4 of Method 6C.

8. Quality Control Procedures

The following quality control procedures are recommended when the results of this method are used for an emission rate correction factor, or excess air determination. The tester should select one of the following options for validating measurement results:

8.1 If both O_2 and CO_2 are measured using Method 3A, the procedures described in Section 4.4 of Method 3 should be followed to validate the O_2 and CO_2 measurement results.

8.2 If only O_2 is measured using Method 3A, measurements of the sample stream CO_2 concentration should be obtained at the sample by-pass vent discharge using an Orsat or Fyrite analyzer, or equivalent. Duplicate samples should be obtained concurrent with at least one run. Average the duplicate Orsat or Fyrite analysis results for each run. Use the average CO_2 values for comparison with the O_2 measurements in accordance with the procedures described in Section 4.4 of Method 3.

8.3 If only CO_2 is measured using Method 3A, concurrent measurements of the sample stream CO_2 concentration should be obtained using an Orsat or Fyrite analyzer as described in Section 8.2. For each run, differences greater than 0.5 percent between the Method 3A results and the average of the duplicate Fyrite analysis should be investigated.

9. Emission Calculation

For all CO_2 analyzers, and for O_2 analyzers that can be calibrated with zero gas, follow Section 8 of Method 6C, except express all concentrations as percent, rather than ppm.

For O_2 analyzers that use a low-level calibration gas in place of a zero gas, calculate the effluent gas concentration using Equation 3A-1.

$$C_{gas} = \frac{C_{ma} - C_{oa}}{C_m - C_o} - (\overline{C} - C_m) + C_{ma} \quad Eq.\ 3A-1$$

Where:

C_{gas} = Effluent gas concentration, dry basis, percent.
C_{ma} = Actual concentration of the upscale calibration gas, percent.
C_{oa} = Actual concentration of the low-level calibration gas, percent.
C_m = Average of initial and final system calibration bias check responses for the upscale calibration gas, percent.
C_o = Average of initial and final system calibration bias check responses for the low-level gas, percent.

$\overline{C}$ = Average gas concentration indicated by the gas analyzer, dry basis, percent.

10. Bibliography

Same as bibliography of Method 6C.

Particulate Loading and Emission Rates

The particulate emission rates were determined per EPA Methods 1 - 5, CFR Title 40, Part 60, Appendix A (revised July 1, 1992). In this procedure a preliminary velocity profile of the gases in the flue is obtained by means of a temperature and velocity traverse. On the basis of these values, sampling nozzles of appropriate diameter are selected to allow isokinetic sampling, a necessary prerequisite for obtaining a representative sample.

The sampling train consists of a heated glass-lined sampling probe equipped with a Type S pitot and a thermocouple. The probe is attached to a sampling module which houses the all-glass in line filter holder in a temperature controlled oven. The sampling module also houses the impinger case and a Drierite filled column. The sampling module is connected by means of an umbilical cord to the control module. The control module houses the dry test gas meter, the calibrated orifice, a leakless pump, two inclined manometers, and all controls required for operating the sampling train.

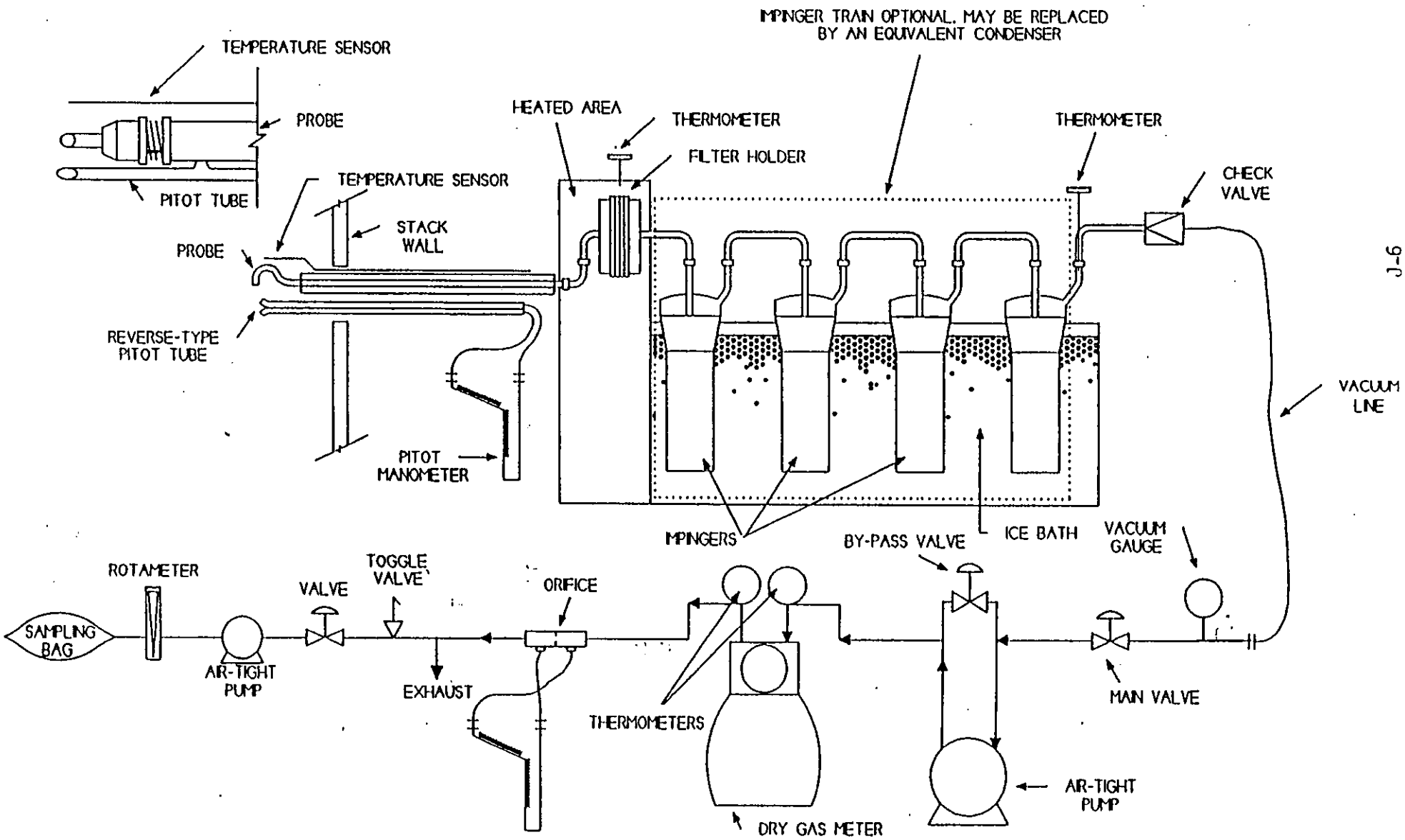
Particulate samples are collected as follows: The sample gas is drawn through the sampling probe isokinetically and passed through a 4-inch diameter Gelman Type A/E glass fiber filter where particulates are removed. The sample gas is then passed through an ice-cooled impinger train and a desiccant-packed column which absorbs remaining moisture. The sample gas then passes through a vacuum pump followed by a dry test gas meter. The gas meter integrates the sample gas flow throughout the course of the test. A calibrated orifice attached to the outlet of the gasmeter provides real time flow rate data.

A representative particulate sample was acquired by sampling for equal periods of time at the centroid of a number of equal area regions in the duct. The sampling rate is adjusted at each test point maintaining isokinetic sampling conditions. Nomographs are used for rapid determination of the sampling rate.

Particulate Loading and Emission Rates

When sampling is complete the filter is removed with tweezers and placed in a clean container. The nozzle, pitot tube and inlet side of the filter holder are quantitatively washed with acetone and the washings are stored in a second container. A brush is often used in the cleaning step to help dislodge deposits. The samples are returned to the laboratory where they are logged in and analyzed. The volume of the acetone rinse ("probe wash") is noted and the rinse is transferred to a tared 120 cc porcelain evaporating dish. The acetone is then evaporated off at 97 - 105 °F. At this elevated temperature condensation of atmospheric moisture is prevented. The acetone-free sample is then dried at 105 °C for 30 minutes, cooled in a desiccator over Drierite, and weighed to the nearest 0.01 mg. The filter sample is transferred to a 6 inch watch glass and dried at 105 °C for two hours. The filter and watch glass are then cooled in a desiccator and the filter weighed to the nearest 0.01 mg. All weighings are performed in a balance room where the relative humidity is maintained at less than 50%. Microscopic examination of the samples is performed if any unusual characteristics are observed. The weight of the acetone rinse blank is subtracted from the samples. The Drierite column is weighed on-site and the water absorbed by the Drierite is added to the condensate to give the total amount of absorbed water.

PARTICULATE SAMPLING TRAIN



Method 6C—Determination of Sulfur Dioxide Emissions From Stationary Sources (Instrumental Analyzer Procedure)

1. Applicability and Principle

1.1 **Applicability.** This method is applicable to the determination of sulfur dioxide (SO_2) concentrations in controlled and uncontrolled emissions from stationary sources only when specified within the regulations.

1.2 **Principle.** A gas sample is continuously extracted from a stack, and a portion of the sample is conveyed to an instrumental analyzer for determination of SO_2 gas concentration using an ultraviolet (UV), nondispersive infrared (NDIR), or fluorescence analyzer. Performance specifications and test procedures are provided to ensure reliable data.

2. Range and Sensitivity

2.1 **Analytical Range.** The analytical range is determined by the instrumental design. For this method, a portion of the analytical range is selected by choosing the span of the monitoring system. The span of the monitoring system shall be selected such that the pollutant gas concentration equivalent to the emission standard is not less than 30 percent of the span. If at any time during a run the measured gas concentration exceeds the span, the run shall be considered invalid.

2.2 **Sensitivity.** The minimum detectable limit depends on the analytical range, span, and signal—to—noise ratio of the measurement system. For a well designed system, the minimum detectable limit should be less than 2 percent of the span.

3. Definitions

3.1 **Measurement System.** The total equipment required for the determination of gas concentration. The measurement system consists of the following major subsystems:

3.1.1 **Sample Interface.** That portion of a system used for one or more of the following: sample acquisition, sample transport, sample conditioning, or protection of the analyzers from the effects of the stack effluent.

3.1.2 **Gas Analyzer.** That portion of the system that senses the gas to be measured and generates an output proportional to its concentration.

3.1.3 **Data Recorder.** A strip chart recorder, analog computer, or digital recorder for recording measurement data from the analyzer output.

3.2 **Span.** The upper limit of the gas concentration measurement range displayed on the data recorder.

3.3 **Calibration Gas.** A known concentration of a gas in an appropriate diluent gas.

3.4 **Analyzer Calibration Error.** The difference between the gas concentration exhibited by the gas analyzer and the known concentration of the calibration gas when the calibration gas is introduced directly to the analyzer.

3.5 **Sampling System Bias.** The difference between the gas concentrations exhibited by the measurement system when a known concentration gas is introduced at the outlet of the sampling probe and when the same gas is introduced directly to the analyzer.

3.6 **Zero Drift.** The difference in the measurement system output reading from the initial calibration response at the zero concentration level after a stated period of operation during which no unscheduled maintenance, repair, or adjustment took place.

3.7 **Calibration Drift.** The difference in the measurement system output reading from the initial calibration response at a mid-range calibration value after a stated period of operation during which no unscheduled maintenance, repair, or adjustment took place.

3.8 **Response Time.** The amount of time required for the measurement system to display 95 percent of a step change in gas concentration on the data recorder.

3.9 **Interference Check.** A method for detecting analytical interferences and excessive biases through direct comparison of gas concentrations provided by the measurement system and by a modified Method 6 procedure. For this check, the modified Method 6 samples are acquired at the sample by-pass discharge vent.

3.10 **Calibration Curve.** A graph or other systematic method of establishing the relationship between the analyzer response and the actual gas concentration introduced to the analyzer.

4. Measurement System Performance Specifications

4.1 **Analyzer Calibration Error.** Less than ± 2 percent of the span for the zero, mid-range, and high-range calibration gases.

4.2 **Sampling System Bias.** Less than ± 5 percent of the span for the zero, and mid— or high-range calibration gases.

4.3 **Zero Drift.** Less than ± 3 percent of the span over the period of each run.

4.4 **Calibration Drift.** Less than ± 3 percent of the span over the period of each run.

4.5 **Interference Check.** Less than ± 7 percent of the modified Method 6 result for each run.

5. Apparatus and Reagents

5.1 **Measurement System.** Any measurement system for SO_2 that meets the specifications of this method. A schematic of an acceptable measurement system is shown in Figure 6C-1. The essential components of the measurement system are described below:

5.1.1 **Sample Probe.** Glass, stainless steel, or equivalent, of sufficient length to traverse the sample points. The sampling probe shall be heated to prevent condensation.

5.1.2 **Sample Line.** Heated (sufficient to prevent condensation) stainless steel or Teflon tubing, to transport the sample gas to the moisture removal system.

5.1.3 **Sample Transport Lines.** Stainless steel or Teflon tubing, to transport the sample from the moisture removal system to the sample pump, sample flow rate control, and sample gas manifold.

5.1.4 **Calibration Valve Assembly.** A three—way valve assembly, or equivalent, for blocking the sample gas flow and introducing calibration gases to the measurement system at the outlet of the sampling probe when in the calibration mode.

5.1.5 **Moisture Removal System.** A refrigerator-type condenser or similar device (e.g., permeation dryer), to remove condensate continuously from the sample gas while maintaining minimal contact between the condensate and the sample gas. The moisture removal system is not necessary for analyzers that can measure gas concentrations on a wet basis; for these analyzers, (1) heat the sample line and all interface components up to the inlet of the analyzer sufficiently to prevent condensation, and (2) determine the moisture content and correct the measured gas concentrations to a dry basis using appropriate methods, subject to the approval of the Administrator. The determination of sample moisture content is not necessary for pollutant analyzers that measure concentrations on a wet basis when (1) a wet basis CO_2 analyzer operated according to Method 3A is used to obtain simultaneous measurements, and (2) the pollutant/CO_2 measurements are used to determine emissions in units of the standard.

5.1.6 **Particulate Filter.** An in-stack or heated (sufficient to prevent water condensation) out—of—stack filter. The filter shall be borosilicate or quartz glass wool, or glass fiber mat. Additional filters at the inlet or outlet of the moisture removal system and inlet of the analyzer may be used to prevent accumulation of particulate material in the measurement system and extend the useful life of the components. All filters shall be fabricated of materials that are nonreactive to the gas being sampled.

5.1.7 **Sample Pump.** A leak-free pump, to pull the sample gas through the system at a flow rate sufficient to minimize the response time of the measurement system. The pump may be constructed of any material that is nonreactive to the gas being sampled.

5.1.8 **Sample Flow Rate Control.** A sample flow rate control valve and rotameter, or equivalent, to maintain a constant sampling rate within 10 percent.

(Note: The tester may elect to install a back-pressure regulator to maintain the sample gas manifold at a constant pressure in order to protect the analyzer(s) from over pressurization, and to minimize the need for flow rate adjustments.)

5.1.9 **Sample Gas Manifold.** A sample gas manifold, to divert a portion of the sample gas stream to the analyzer, and the remainder to the by-pass discharge vent. The sample gas manifold should also include provisions for introducing calibration gases directly to the analyzer. The manifold may be constructed of any material that is nonreactive to the gas being sampled.

5.1.10 **Gas Analyzer.** A UV or NDIR absorption or fluorescence analyzer, to determine continuously the SO_2 concentration in the sample gas stream. The analyzer shall meet the applicable performance specifications of Section 4. A means of controlling the analyzer flow rate and a device for determining proper sample flow rate (e.g., precision rotameter, pressure gauge downstream of all flow controls, etc.) shall be provided at the analyzer.

(Note: Housing the analyzer(s) in a clean, thermally-stable, vibration-free environment will minimize drift in the analyzer calibration.)

5.1.11 **Data Recorder.** A strip chart recorder, analog computer, or digital recorder, for recording measurement data. The data recorder resolution (i.e., readability) shall be 0.5 percent of span. Alternatively, a digital or analog meter having a resolution of 0.5 percent of span may be used to obtain the analyzer responses and the readings may be recorded manually. If this alternative is used, the readings shall be obtained at equally spaced intervals over the duration of the sampling run. For sampling run durations of less than 1 hour, measurements at 1—minute intervals or a minimum of 30 measurements, whichever is less restrictive, shall be obtained. For sampling run durations greater than 1 hour, measurements at 2—minute intervals or a minimum of 96 measurements, whichever is less restrictive, shall be obtained.

5.2 **Method 6 Apparatus and Reagents.** The apparatus and reagents described in Method 6, and shown by the schematic of the sampling train in Figure 6C-2, to conduct the interference check.

5.3 **SO2 Calibration Gases.** The calibration gases for the gas analyzer shall be SO_2 in N_2 or SO_2 in air. Alternatively, SO_2/CO_2, SO_2/O_2, or $SO_2/CO_2/O_2$ gas mixtures in N_2 may be used. For fluorescence-based analyzers, the O_2 and CO_2 concentrations of the calibration gases as introduced to the analyzer shall be within 1 percent (absolute) O_2 and 1 percent (absolute) CO_2 of the O_2 and Co_2 concentrations of the effluent samples as introduced to the analyzer. Alternatively, for fluorescence-based analyzers, use calibration blends of SO_2 in air and the nomographs provided by the vendor to determine the quenching correction factor (the effluent O_2 and CO_2 concentrations must be known). Use three calibration gases as specified below:

5.3.1 **High-Range Gas.** Concentration equivalent to 80 to 100 percent of the span.

5.3.2 **Mid-Range Gas.** Concentration equivalent to 40 to 60 percent of the span.

5.3.3 **Zero Gas.** Concentration of less than 0.25 percent of the span. Purified ambient air may be used for the zero gas by passing air through a charcoal filter, or through one or more impingers containing a solution of 3 percent H_2O_2.

6. Measurement System Performance Test Procedures

Perform the following procedures before measurement of emissions (Section 7).

6.1 **Calibration Gas Concentration Verification.** There are two alternatives for establishing the concentrations of calibration gases. Alternative Number 1 is preferred.

6.1.1 **Alternative Number 1**—*Use of calibration gases that are analyzed following the* Environmental Protection Agency Traceability Protocol Number 1 (see Citation 1 in the Bibliography). Obtain a certification from the gas manufacturer that Protocol Number 1 was followed.

6.1.2 **Alternative Number 2**—Use of calibration gases not prepared according to Protocol Number 1. If this alternative is chosen, obtain gas mixtures with a manufacturer's tolerance not to exceed ± 2 percent of the tag value. Within 6 months before the emission test, analyze each of the calibration gases in triplicate using Method 6. Citation 2 in the Bibliography describes procedures and techniques that may be used for this analysis. Record the results on a data sheet (example is shown in Figure 6C-3). Each of the individual SO_2 analytical results for each calibration gas shall be within 5 percent (or 5 PPM, whichever is greater) of the triplicate set average; otherwise, discard the entire set, and repeat the triplicate analyses. If the average of the triplicate analyses is within 5 percent of the calibration gas manufacturer's cylinder tag value, use the tag value; otherwise, conduct at least three additional analyses until the results of six consecutive runs agree with 5 percent (or 5 PPM, whichever is greater) of their average. Then use this average for the cylinder value.

6.2 **Measurement System Preparation.** Assemble the measurement system by following the manufacturer's written instructions for preparing and preconditioning the gas analyzer and, as applicable, the other system components. Introduce the calibration gases in any sequence, and make all necessary adjustments to calibrate the analyzer and the data recorder. Adjust system components to achieve correct sampling rates.

6.3 **Analyzer Calibration Error.** Conduct the analyzer calibration error check by introducing calibration gases to the measurement system at any point upstream of the gas analyzer as follows:

6.3.1 After the measurement system has been prepared for use, introduce the zero, mid-range, and high-range gases to the analyzer. During this check, make no adjustments to the system except those necessary to achieve the correct calibration gas flow rate at the analyzer. Record the analyzer responses to each calibration gas on a form similar to Figure 6C-4.

Note: A calibration curve established prior to the analyzer calibration error check may be used to convert the analyzer response to the equivalent gas concentration introduced to the analyzer. However, the same correction procedure shall be used for all effluent and calibration measurements obtained during the test.

6.3.2 The analyzer calibration error check shall be considered invalid if the gas concentration displayed by the analyzer exceeds ± 2 percent of the span for any of the calibration gases. If an invalid calibration is exhibited, take corrective action, and repeat the analyzer calibration error check until acceptable performance is achieved.

6.4 **Sampling System Bias Check.** Perform the sampling system bias check by introducing calibration gases at the calibration valve installed at the outlet of the sampling probe. A zero gas and either the mid-range or high-range gas, whichever most closely approximates the effluent concentrations, shall be used for this check as follows:

6.4.1 Introduce the upscale calibration gas, and record the gas concentration displayed by the analyzer on a form similar to Figure 6C-5. Then introduce zero gas, and record the gas concentration displayed by the analyzer. During the sampling system bias check, operate the system at the normal sampling rate, and make no adjustments to the measurement system other than those necessary to achieve proper calibration gas flow rates at the analyzer. Alternately introduce the zero and upscale gases until a stable response is achieved. The tester shall determine the measurement system response time by observing the times required to achieve a stable response for both the zero and upscale gases. Note the longer of the two times as the response time.

6.4.2 The sampling system bias check shall be considered invalid if the difference between the gas concentrations displayed by the measurement system for the analyzer calibration error check and for the sampling system bias check exceeds ± 5 percent of the span for either the zero or upscale calibration gas. If an invalid calibration is exhibited, take corrective action, and repeat the sampling system bias check until acceptable performance is achieved. If adjustment to the analyzer is required, first repeat the analyzer calibration error check, then repeat the sampling system bias check.

7. Emission Test Procedure

7.1 **Selection of Sampling Site and Sampling Points.** Select a measurement site and sampling points using the same criteria that are applicable to Method 6.

7.2 **Interference Check Preparation.** For each individual analyzer, conduct an interference check for at least three runs during the initial field test on a particular source category. Retain the results, and report them with each test performed on that source category. If an interference check is being performed, assemble the modified Method 6 train (flow control valve, two midget impingers containing 3 percent H_2O_2, and dry gas meter) as shown in Figure 6C-2. Install the sampling train to obtain a sample at the measurement system sample by-pass discharge vent. Record the initial dry gas meter reading.

7.3 **Sample Collection.** Position the sampling probe at the first measurement point, and begin sampling at the same rate as used during the sampling system bias check. Maintain constant rate sampling (i.e., ± 10 percent) during the entire run. The sampling time per run shall be the same as for Method 6 plus twice the system response time. For each run, use only those measurements obtained after twice response time of the measurement system has elapsed, to determine the average effluent concentration. If an interference check is being performed, open the flow control valve on the modified Method 6 train concurrent with the initiation of the sampling period, and adjust the flow to 1 liter per minute (± 10 percent).

(Note: If a pump is not used in the modified Method 6 train, caution should be exercised in adjusting the flow rate since overpressurization of the impingers may cause leakage in the impinger train, resulting in positively biased results).

7.4 **Zero and Calibration Drift Tests.** Immediately preceding and following each run, or if adjustments are necessary for the measurement system during the run, repeat the sampling system bias check procedure described in Section 6.4 (Make no adjustments to the measurement system until after the drift checks are completed.) Record and analyzer's responses on a form similar to Figure 6C-5.

7.4.1 If either the zero or upscale calibration value exceeds the sampling system bias specification, then the run is considered invalid. Repeat both the analyzer calibration error check procedure (Section 6.3) and the sampling system bias check procedure (Section 6.4) before repeating the run.

7.4.2 If both the zero and upscale calibration values are within the sampling system bias specification, then use the average of the initial and final bias check values to calculate the gas concentration for the run. If the zero or upscale calibration drift value exceeds the drift limits, based on the difference between the sampling system bias check responses immediately before and after the run, repeat both the analyzer calibration error check procedure (Section 6.3) and the sampling system bias check procedure (Section 6.4) before conducting additional runs.

7.5 **Interference Check (if performed).** After completing the run, record the final dry gas meter reading, meter temperature, and barometric pressure. Recover and analyze the contents of the midget impingers, and determine the SO_2 gas concentration using the procedures of Method 6. (It is not necessary to analyze EPA performance audit samples for Method 6.) Determine the average gas concentration exhibited by the analyzer for the run. If the gas concentrations provided by the analyzer and the modified Method 6 differ by more than 7 percent of the modified Method 6 result, the run is invalidated.

8. Emission Calculation

The average gas effluent concentration is determined from the average gas concentration displayed by the gas analyzer, and is adjusted for the zero and upscale sampling system bias checks, as determined in accordance with Section 7.4. The average gas concentration displayed by the analyzer may be determined by integration of the area under the curve for chart recorders, or by averaging all of the effluent measurements. Alternatively, the average may be calculated from measurements recorded at equally spaced intervals over the entire duration of the run. For sampling run durations of less than 1 hour, measurements at 1—minute intervals or a minimum of 30 measurements, whichever is less restrictive, shall be used. For sampling run durations greater than 1 hour, measurements at 2—minute intervals or a minimum of 96 measurements, whichever is less restrictive, shall be used. Calculate the effluent gas concentration using Equation 6C-1.

$$\overline{C}_{gas} = (C - Co)\,\frac{C_{ma}}{C_m - Co} \quad Eq.\ 6C - 1$$

Where:

C_{gas} = Effluent gas concentration, dry basis, PPM.

$\overline{C}$ = Average gas concentration indicated by gas analyzer, dry basis, PPM.

Co = Average of initial and final system calibration bias check responses for the zero gas, PPM.

C_m = Average of initial and final system calibration bias check responses for the upscale calibration gas, PPM.

C_{ma} = Actual concentration of the upscale calibration gas, PPM.

9. Bibliography

1. Traceability Protocol for Establishing True Concentrations of Gases Used for Calibrations and Audits of Continuous Source Emission Monitors: Protocol Number 1. U.S. Environmental Protection Agency, Quality Assurance Division. Research Triangle Park, NC. June 1978.

2. Westlin, Peter R. and J. W. Brown. Methods for Collecting and Analyzing Gas Cylinder Samples. Source Evaluation Society Newsletter. 3(3):5-15. September 1978.

|_See_CFR_paper_publication_for_illustration_0809

|_See_CFR_paper_publication_for_illustration_0810

APPENDIX K

CALCULATION EQUATIONS

METHOD 2
CALCULATION EQUATIONS

$$\overline{V}_s = 85.49\ C_p\ (\sqrt{\Delta p})_{avg}\ \sqrt{\frac{T_{s(avg)}}{P_s\ M_s}}$$

$$Q_{s,\,d} = 60\ (1 - B_{ws})\ \overline{V}_s\ A\ (\frac{528}{T_{s\ (avg)}})\ (\frac{P_s}{29.92})$$

$$Q_a = 60\ \overline{V}_s\ A$$

$$\dot{m}_g = \frac{4.995\ Q_{s,\,d}\ G_d}{1 - B_{ws}}$$

$$RH^* = 100\ (vp_{twb} - 0.0003641\ P_s\ (T_{db} - T_{wb}))/vp_{tdb}$$

$$B^*_{ws} = RH(vp_{tdb})/P_s$$

$$\rho = \frac{4.585\ x\ 10^{-2}\ P_s M_s}{T_s\ (avg)}$$

*Alternate equations for calculating moisture content from wet bulb and dry bulb data.

SYMBOLS

A	=	Cross Sectional area of stack, SQ. FT.
A_n	=	Cross sectional area of nozzle, SQ. FT.
B_{ws}	=	Water vapor in gas stream, proportion by volume
C_p	=	Pitot tube coefficient, dimensionless
C_a	=	Concentration of particulate matter in stack gas, wet basis, GR/ACF
C_s	=	Concentration of particulate matter in stack gas, dry basis, corrected to standard conditions, GR/DSCF
EA	=	Excess air, percent by volume
γ	=	Dry test meter correction factor, dimensionless
G_d	=	Specific gravity (relative to air), dimensionless
I	=	Isokinetic variation, percent by volume
M_d	=	Molecular weight of stack gas, dry basis, g/g - mole.
$\dot{m}_g$	=	Mass flow of wet flue gas, LB/HR
$\dot{m}_p$	=	Particulate mass flow, LB/HR
M_s	=	Molecular weight of stack gas, wet basis, g/g mole.
M_p	=	Total amount of particulate matter collected, g
P_{bar}	=	Atmospheric pressure, IN. HG. (uncompensated)
P_g	=	Stack static gas pressure, IN. WC.
P_s	=	Absolute pressure of stack gas, IN. HG.
P_{std}	=	Standard absolute pressure, 29.92 IN. HG.
A_a	=	Actual volumetric stack gas flow rate, ACFM
$Q_{s,d}$	=	Dry volumetric stack gas flow rate corrected to standard conditions, DSCFM
RH	=	Relative humidity, %

T_{db}	=	Dry bulb temperature of stack gas, °F
T_{wb}	=	Wet bulb temperature of stack gas, °F
$T_{m(avg)}$	=	Absolute average dry gas meter temperature, °R
$T_{s(avg)}$	=	Absolute average stack temperature, °R
T_{std}	=	Standard absolute temperature, 528 °R (68 °F)
θ	=	Total sampling time, min.
V_{lc}	=	Total volume of liquid collected in impingers and silica gel, ml
V_m	=	Volume of gas sample as measured by dry gas meter, CF
$V_{m(std)}$	=	Volume of gas sample measured by the dry gas meter corrected to standard conditions, DSCF
$V_{w(std)}$	=	Volume of water vapor in the gas sample corrected to standard conditions, SCF
$\bar{V}_s$	=	Average actual stack gas velocity, FT/SEC
vp_{tdb}	=	Vapor pressure at T_{db}, IN. HG.
vp_{twb}	=	Vapor pressure at T_{wb}, IN. HG.
$\overline{\Delta H}$	=	Average pressure differential across the orifice meter, IN. WC.
ΔP	=	Velocity pressure of stack gas, IN. WC.
γ	=	Dry test meter correction coefficient, dimensionless
ρ	=	Actual gas density, LB/ACF

METHOD 3
CALCULATION EQUATIONS

$$\%EA = \frac{100(\%O_2 - 0.5\%\ CO)}{0.264\%\ N_2 - \%O_2 + 0.5\%\ CO}$$

$$M_d = 0.44(\%CO_2) + 0.32\ (\%O_2) + 0.28\ (\%N_2 + \%CO)$$

$$M_s = M_d\ (I - B_{ws}) + 0.18\ B_{ws}$$

$$B_{ws} = \frac{V_{w(std)}}{V_{w(std)} + V_{m(std)}}$$

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METHOD 5
CALCULATION EQUATIONS

$$V_{m(std)} = 17.65\ V_m\ \gamma\ \left(\frac{P_{bar} + \overline{\Delta H}/13.6}{T_{m(avg)}}\right)$$

$$V_{w(std)} = 0.0472\ V_{lc}$$

$$B_{ws} = \frac{V_{w(std)}}{V_{w(std)} + V_{m(std)}}$$

$$I = 0.0944\ \left(\frac{T_{s(avg)}\ V_{m(std)}}{P_s\ V_s\ A_n\ \theta\ (I - B_{ws})}\right)$$

$$C_s = \frac{15.43\ M_p}{V_{m(std)}}$$

$$C_a = \frac{272.3\ M_p\ P_s}{T_{s(avg)}\ (V_{w(std)} + V_{m(std)})}$$

$$(\dot{m}_p)_1 = 8.5714\ x\ 10^{-3}\ C_s\ Q_{s,\ d}$$

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$$(\dot{m}_p)_2 = \frac{1.3228 \ x \ 10^{-1} \ M_p \ A}{\theta \ A_n}$$

$$\dot{m}_p = \frac{(\dot{m}_p)_1 + (\dot{m}_p)_2}{2}$$

CALCULATION OF (GR/DSCF) AND
(LB/HR) FROM (PPM,D)

$$ppm = \frac{uL}{L} = \frac{mL}{m^3}$$

$$\frac{LB}{DSCF} = \frac{uL}{L} \times \frac{28.316\ L}{DSCF} \times \frac{M\ (ug)}{24.054\ uL} \times \frac{g}{10^6 ug} \times \frac{LB}{453.6\ g}$$

OR,

$$\frac{LB}{DSCF} = 2.595 \times 10^{-9}\ M\ (ppm,d)$$

where M = Molecular weight of compound.

Then,

$$\frac{LB}{HR} = \frac{LB}{DSCF} \times \frac{DSCF}{MIN} \times \frac{60\ MIN}{HR}$$